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MACHINERY FOR SPINNING.

We give a large portion of our space in this issue to machinery employed for the spinning operations in a mill, as a sequence to that employed in the preparatory processes, including carding and roving, which were described and illustrated in our September issue. That and the present issue give to our readers a succinct yet intelligent comprehension of the mechanical appliances, and their functions, used in American mills for converting the raw material into yarn ready for fabrication.

The fundamental principles of modern methods of spinning received their first development in a practical form with the advent of the system introduced by Richard Arkwright in the second half of the eighteenth century. The superstructure of cotton manufacturing by the Arkwright system was based upon the application of the mechanism developed in the Saxony flax-wheel out of which was evolved the throstle fly frame which took as its prototype the flyer of this wheel. Arkwright's first machine was known as the "water frame," but after it was operated by steam power it received the name of the "throstle," but its product retained its old name of "water twist."

SPINNING WITHOUT INTERVENTION OF HUMAN FINGERS.

Who the inventor was of the system of spinning a textile thread without the intervention of human fingers is a disputed point, it is simply known that Arkwright made it a practical success whether he was the inventor or not. It is unnecessary for us to enter into a discussion regarding the inventions and their utility of Wyatt and Paul to whom is justly credited the conception of employing one pair of rollers in drawing the roving from the spool and delivering it to the spindle, but Arkwright is entitled indisputably to the invention of spinning by a series of rollers running at different speeds for drafting; and it is an acknowledged fact that the manufacture of this yarn by the roller system was never achieved until Arkwright took hold of it. Considering this fact, Arkwright's patent of 1769 is of more consequence to the cotton manufacturing industry than any that preceded it. His second patent in 1775 covered all of the operations involved in his system of a complete cotton factory, such as he established at Cromford, England, where he had frames running with the bobbins of roving set in skewers in a creel from which the roving passed down to the drawing rolls, which were turned by contrate wheels, the attenuated roving being delivered by the front rolls and twisted by the rotation of the spindle and flyer, and wound by friction around the bobbins which were made to traverse up and down for the distribution of the spun yarn upon them by the rise and fall of a copping rail. It was this plan of spinning that was adopted by Samuel Slater in his Pawtucket, R. I. mill.

THE COPPING RAIL.

It may be stated that the traverse or copping rail was the invention of Coniah Wood, in 1772, and dispensed with the heck upon the flyer as seen in the Saxony wheel. Arkwright adopted Wood's idea, but added important improvements as that of a heart-shaped cam which made

the winding action automatic. With his improved machine, Arkwright was able to turn off warp and hosiery yarn as fine as 80s or even 100s, which bears a favorable comparison with the best work that is done to-day. Arkwright's machine was first used chiefly to fill the demand for hosiery yarn, which was required to be particularly smooth and uniform in order that it could easily pass through the needles of the stocking frame. Even as late as 1840 a few old Arkwright machines were in existence both at Cromford and Belper, England, for spinning hosiery and thread yarns as fine as number 80.

CAP SPINNING.

The machines used by Samuel Slater in his Pawtucket mill were of his own construction according to the Arkwright system, and the throstle which he used was so simple in its construction and so well adapted to its purpose that but few alterations or improvements were necessary for many years after its introduction, or not until about 1829, when Charles Danforth, Paterson, N. J., brought out his invention of cap spinning, which in a modified form is used for worsted spinning to-day. All improvements prior to this invention were invariably directed to the alteration of the spindle and flyer with the mode of supporting or driving them or for improving the drag. Danforth's invention did entirely away with the flyer and produced a quality of yarn less wiry and better adapted for the manufacture of cotton for certain styles of goods.

RING SPINNING.

A serious objection to the fly throstle frame was that its speed was limited because of the tendency of the flyer to spread due to the centrifugal force which was developed by the rapid revolving of the spindle; and to construct the flyer so that it should be stronger, enough to overcome this tendency would have resulted in loading the spindle with a heavier burden which would have required a greater expenditure of power to carry. This objection, among others, was the incentive for the invention of ring spinning by John Thorpe, Providence, R. I., in 1828. This invention was greatly appreciated by the adaptation of the machine to the employment of women and children, whose labor could be secured at a less cost than that of men, whose labor was more difficult to obtain, while that of women and children was plenty. The ring used in Thorpe's invention was substantially the same as the common single ring of to-day and was used in increasing numbers and without material change, except in the rail which supported it, up to the early 60s, when the machine began to receive more serious attention from inventors.

William Mason introduced the ring spinning frame, at Killingly, Conn., in 1833, and built quite a number there, but afterwards moved to Taunton in the spring of 1836 where he continued its manufacture. All the successful ring spinning frames that were built up to 1840 were made by him, when P. Whitin & Sons commenced to build them.

In 1868, C. V. Morse brought out an invention for adjusting the ring on the top of the rail without reference to the hole in it. This latter device was followed by other forms of adjustment until, in 1872 the plate holder, so-called, which is in almost universal use to-day, was invented by S. S. Shorey.

POSITION OF DRAFTING ROLLS.

It is only within comparatively recent times that the drafting rolls have been placed at an angle. Prior to this they were placed horizontally in the frame, so that the roving remained in contact with the front bottom roll nearly ⅜ of an inch below the nip, between it and the top roll, thus preventing the twist in the yarn from running directly up to the point of contact between the rolls, which is an essential requirement for good spinning. This fault led to the adoption of the inclined position for the rolls as seen in all modern frames, which allows the twist to run up to the nip of the front or delivery rolls, thus making a stronger and better yarn, at the same time producing a softer twisted yarn when required.

IMPORTANT SPINDLE IMPROVEMENTS.

For the improvement of the ring frame a number of important points have had to be considered, as lessening the amount of vibration of the spindle, for instance, due to the high speed at which it is required to run. This led to the necessity of studying the proper form of the spindle, the foot step, and the bolster and their relation to each other, as well as the means of lubricating wherever there is friction. It was a long time before these obstacles were met with any great success, but they have now been practically mastered.

All the important spindle improvements, it may be said, have been made since 1870. About 1860, when the ring came rapidly into use by mills in the United States the weight of the spindle was from 12 to 16 ounces, and the greatest speed at which it could be economically run was 5,500 revolutions per minute, at which speed one-horse power could run 70 to 100 spindles. Immediate attention was then given to improving the spindle by reducing its weight, and consequently the amount of power consumed for operating it, and the weight was brought down to 8 ounces, and in a few cases to 6 ounces, but difficulty was found in increasing its speed because of the liability of the lighter spindle springing out of true and throwing off the bobbin during the process of spinning. In order to overcome these defects Francis J. Rabbeth brought out his 1866 invention for running the spindle in a tube which contained both bolster and step bearing, which did not require oiling oftener than once in several months. This brought the spindle up to its comparative excellence as it was in 1870, when improvements began to be made rapidly.

THE SELF-ACTING MULE.

The first self-acting mule was in many respect the greatest achievement of mechanical ingenuity that has ever been consummated. It was the off-spring of Hargreaves's "jenny" and Arkwright's "water frame." It was the invention of Samuel Crompton who conceived it in 1774, but it was not brought out until 1779, and was not perfected so as to come into general use until about 1786. It probably would not have then appeared for many years later had it not been for the declared invalidity of Arkwright's patent which embodied the system of drawing rolls. Crompton's machine had two elements for overcoming irregularities in roving, one in the drafting rolls and the other in the stretch effected by the movement of the carriage.

It is impossible to enumerate the various additions that were made to Crompton's original scheme in order to bring it to a state of practicability. It took years to bring all of the additional devices or mechanisms into their proper relations. Therefore, in the early days of the machine all of its most delicate or nicest movements had to be performed by the hand of the spinner, such as the building of the cop upon the spindle, the backing off of the carriage previous to winding, and the regulation of the speed

of the spindle during the latter operation, and with the single faller wire which it then possessed, it was found impossible to prevent the yarn running into snarls, which was not remedied until the invention of that simple device known as the counter faller.

INVENTIONS OF RICHARD ROBERTS.

One of the most important improvements in the mule was the invention of William Eaton, in 1818, of a copping motion which performed all of the operations of winding the thread on the spindle, rendering the machine in this respect automatic. Notwithstanding Eaton's winding motion was an extremely ingenious one, the great objection to its immediate adoption was its complexity and uncertainty of action, which was rectified by the subsequent improvements of Richard Roberts through whose ingenuity, and appreciation of the proper relation between the action of different mechanisms, the first self-acting mule was constructed with view of overcoming the objections of previous inventions. Mr. Roberts's efforts commenced in 1825 and extended over a number of years. His first scheme was a method of governing the winding on of the yarn to form a cop, and was the first step in the accomplishment of the ends sought for. This invention consisted of, or was soon developed into, that part of the machine known as the quadrant.

INTRODUCTION OF THE MULE INTO THE UNITED STATES.

The first of Mr. Roberts's mules that were introduced into the United States were smuggled in, in 1839, by Bradford Durfee of Fall River, Mass. Ira Gay, of Nashua, N. H., built a self-acting mule in 1825-26, but there appears to be no record of its success more than that the Nashua Mfg. Co. used one or two of the machines for filling. William Mason, Taunton, Mass., commenced experimenting on the self-acting mule in 1837, and added a number of improvements. In 1880, the Mason mule was pronounced by some manufacturers as doing more work with the same power than any other mule built at that date. The machine, as it exists to-day in its perfected form, is fully described and illustrated in other parts of this issue.

TARIFF REVISION.

The principal subject of popular interest in the deliberations of congress is the revision of the customs tariff. The necessity of a revision lies in the changed industrial conditions that now exist compared with those that prevailed in 1897 when the present tariff found its being.

The tariff of 1897 has had an extraordinary duration, and in this respect reflects great credit upon those who had to do with its framing, in the full understanding of the interpretations placed on the language used in previous acts by those in authority, and in the thorough comprehension of the industrial position of the country as to its then and future requirements. During its entire existence it has shown itself to be the most perfect tariff ever devised, both scientifically and practically, especially in its relation to the schedules on textiles as expressive of the wants of those connected with their manufacture and the purpose of the congress that enacted it. Considering its almost impregnability in its structural features, it is improbable, as it would be unwise, that it will, in this particular, be materially modified, and that the changes which may be made will apply chiefly and essentially to rates of duty. These latter are unquestionably out of proper poise in some instance, with the present requirements of the industries for which they were instituted as a protection against a foreign competition that might result in their subversion. Yet, whatever may be said or written concerning this act, the fact remains that, as an instrument affecting the industrial growth of the country, it has not in any essential particular militated against the domestic and foreign commercial activities of the country so far as they can be measured by comparison with anything that is of record in previous periods. From this point of view, rising as it does above the arena of adverse criticism, it has been and is questioned in the minds of many whether the time has really arrived when changes in rates, even, should be made as necessary to promote or protect industrial and commercial enterprises that do not already have the requisite stimulus for their existence, and, if changes are called for, whether they are not more applicable to a few articles than to the entire list.

In order to meet an equitable claim of the great consuming masses of the country there may appear a necessity for reducing the rates of duty on certain imports of foreign goods, so that the cost of the competing domestic product shall not be unduly high. But in the majority of instances the claim is more apparent than real, especially in those where the domestic competition is brisk and aggressive, as may be said to be generally the case regarding commodities that enter into daily consumption.

On the ground of theoretic equity, no rate of duty on imports for purposes of protecting the home industry, should exceed that essential for the industry to receive a fair profit, under good management, so far as it might otherwise be affected by competition with the products made in other countries under lower cost conditions that would not be countenanced in this country because of their demoralizing political and social effect upon us as a people with a high standard of civilization. But the line of theoretic equity is very difficult to determine, and its establishment has always been the bete noire in tariff legislation. It has always been the policy in the construction of a tariff along the lines of adequate protection, to fix the rates of duty above the limits of simple protection, as near as this can be ascertained, so as to cover the undervaluation of imports from any cause whatever. The importance of this policy has been substantiated by practical experience in the administration of the law. This policy, no doubt, will be pursued, in its intent, in the revision of the tariff that is now in contemplation, but the probabilities are that it will be conservatively advanced.

Those parts of the customs laws which will engross, particularly, the deliberation of the congressional committees entrusted with their revision, will be those affecting their administration and such political features as will enable the executive department of the government to enter into conventional agreements by which the United States shall have the full benefit of the most favorable tariff privileges extended by foreign nations to their imports from other countries. This may involve the necessity of fixing upon some scheme for maximum and minimum rates of duty upon foreign goods, which will be subject to the former unless compensating concessions are made by the country of export advantageous to American imports enough to warrant the application of the latter rates. This, of course, is simply a question of reciprocity or bargaining with clubs in the hands of contestants. It is in harmony with present methods among nations for driving a sharp

trade in commerce. It can not be looked upon as a dignified position for any nation to assume, of threatening another with a "big stick" not to do a certain act, but it has been passed upon, or acceded to, as a rough comity among governments in the execution of customs laws for the regulation of commercial relations.

Our tariff laws of recent enactment have taken cognizance of the principle of reciprocity in the application of rates of duty upon imports, but it has never been considered drastic in execution or requiring more than a limited exercise in practice. A wider scope will now be given it consistent with the attitude of other nations in the administration of their tariff laws detrimentally to the industries of the United States. It is one of those things that have to be recognized as an existing condition, and has to be met in the same manner and form as we find it.

There is no positive evidence of the way congress will act concerning a revision of the customs administrative act that was passed in 1890 and slightly modified in 1897, and now in force. Some changes will, unquestionably, be made so as to bring it into more consistent relationship with the practice of reciprocity. The conventional tariff with Germany, which has affected the provisions of this act more than those directly applicable to customs rates of duty, will receive its full share of attention, forced it may be, because of the emphatic protests against its stipulations from the textile manufacturers, especially those engaged in the production of hosiery and knit-goods. As it stands it is particularly hostile to the knitting industry of this country, not so much as what it has permitted to be done as in its menacing attitude of the possibilities and probabilities which its provisions make it capable of assuming. This is an offspring of the conventional tariff system of Germany which had its being about 1891, but which had not come into vogue at the time of the enactment of the 1897 tariff law, except with a few of the European countries. Though the policy was a new one, sufficiently to make it a distinctive one from that previously existing, the aggressive manner with which it has been pressed into national negotiations concerning commercial relations, is likely to impress its peculiarities upon the tariff tenets of the United States as they have prevailed from the earliest times.

Until now, the United States has been free from reciprocity treaties, except the one with Canada in 1855, and the one with Hawaii in 1875. How far we are willing to go in accepting the German policy in the revision of our customs laws, will be watched by our industrial interests with extreme acuteness, and modifications of the existing agreement will be demanded in no uncertain way, by every branch of the textile industry, at least, as shown elsewhere in this issue as coming from the knit-goods manufacturers. The German policy, so far as that country is concerned, is twofold—protection to its domestic industries, and the opening of foreign markets to them by the breaking down of foreign tariffs, as that of the United States, for example. It is a bold but well devised scheme, and aquiescence in it, in full, by this country will be fraught with dangers to many of our manufacturing enterprises, unless safeguarded by means or methods of administration, not yet developed, that can be relied upon as protective against the machinations of unscrupulous exporters and importers.

The maximum and minimum principle in the fixing of tariff rates of duty on imports will surely be put into effect in the forthcoming law, because of its political and commercial necessity to conform to new economical problems that have been created by other nations whose domestic industries have been affected by conditions unforeseen fifteen or twenty years ago. This principle has characterized the tariffs of France, and its practical working has met with commendation from many quarters. The Republican party and President-elect Taft are committed to the incorporation of this principle in any tariff revision that may be made. The necessity of this form of tariff is not so apparent for the United States as it is for European countries, as the latter are not so abundantly favored with natural resources and a broad home market as the former The object of foreign countries is to force open our doors for their manufactures, and, at the same time, obtain our agricultural products at a comparatively low cost.

NATIONAL ASSOCIATION OF WOOL MANUFACTURERS.

John Bruce McPherson, who for five years has been the secretary of the National Association of Wool Manufacturers, has resigned, and on the first of the new year retired from that responsible position. In March, 1907, Mr. McPherson had a serious illness which kept him from the office for more than six months. Even after the lapse of that time he was obliged to curtail his customary working day so that his usual activities were considerably restricted. During the past summer, when tariff revision was declared for by the two leading political parties, and active preparation for that revision was certain to come this winter, Mr. McPherson's physicians advised him to give up his position, his strength, in their opinion, being scarcely equal to the long and exacting demands of such a campaign in Washington. Acting upon that advice he tendered his resignation August 17, to take effect upon the election of his successor. On September 22, the resignation was accepted by the Executive Committee, January 1, being the date set by the committee for it to take effect.

At the same meeting Winthrop L. Marvin, of Boston, was elected as the successor to Mr. McPherson. For sixteen years Mr. Marvin was an editorial writer on the *Boston Journal*, the latter part of the time being the chief editorial writer and associate editor. Mr. Marvin has had occasion to write much of the tariff and New England industries. He is the author of "The American Merchant Marine; Its History and Romance," published by Charles Scribner's Sons in 1902. From 1901-1904 he was a member of the Massachusetts Civil Service Commission, and in 1904-1905 he was the Secretary of the Congressional Merchant Marine Commission in Washington.

Other things being equal, the value of a food should depend upon the amount of protein present. This is due in part to the fact that it can do more things in the animal body than any other of the constituents fed.

If you have never fed one to seven hulls and meal, you can not appreciate its splendidly proportioned qualities, the hulls are chopped up fine, the kernels of the seed thoroughly cooked and pressed into cakes to extract the oil, they are then ground into meal which is mixed in proportion of one pound of meal to seven pounds of hulls, giving what the government experts declare to be the best proportioned cattle feed in the world.

POSITION OF THE COTTON TRADE IN GREAT BRITAIN.

ENGLAND IS PRODUCING THE FINEST FABRICS. OTHER PARTS OF THE EMPIRE ARE GIVING ATTENTION TO THE COARSEST KINDS. THE WORLD'S COTTON MANUFACTURES VALUED AT $2,250,000,000.

The English delegates who attended the Atlanta conference of cotton spinners and cotton growers, October, 1907, held a banquet in Manchester, England, last November, the speeches at which had reference to the position of trade in Great Britain and the prospects for its future.

C. W. Macara, who took a conspicuous part in the discussions at the Atlanta conference, was chairman of the occasion, and in response to a toast referred to the "happy idea that there should be a reunion of the representatives of the cotton industry of England, who, along with the representatives of the other cotton-using countries of Europe, crossed the Atlantic in autumn last year to attend the Atlanta conference.

"Although England and her dependencies own nearly one-half of the spindles of the world, the consumption of cotton by these spindles is less than one-third of the total crop. The industry in England is engaged in producing the finest of fabrics; in other parts of the empire chief attention is given to the coarsest counts. In order to gauge the value of the cotton industry in any country one must take into account both the number of spindles and the consumption of cotton. I estimate that the value of the world's cotton crop is, at present prices, over $1,000,000,000, and the manufactured fabrics represent about $2,250,000,000. A consideration of these facts will show how utterly impossible it is without internal action to deal with the many problems that arise or to remove abuses connected with the handling and the marketing of cotton.

"Much attention has been given during the past ten years to the formulation of a scheme for the regulation of wages according to the state of trade. I admit that the task is surrounded with difficulties, but if these difficulties are faced with a determination to overcome them it will be found they are not insuperable. The revised scheme which has been in operation for three years, perhaps in a crude form, is really a scheme of arbitration without an arbitrator, and I am of opinion that had the parties decided to abide by its working and accept margins between cotton and yarn the two last advances in wages would have been granted under it, and the reduction which has just been agreed to would have been accepted without one moment's break of harmonious relations."

Francis Ashworth, President of the Manchester Chamber of Commerce was called upon and responded as follows:

"Now that the conflict in the cotton spinning trade was happily at an end the question of paramount interest to those who are dependent on the industry—indeed I may say to all Lancashire—is the prospect for next year's trade. I am no prophet, of course, and can only reason from the facts before us and probabilities based on the experience of the past. We seem to be assured of a very ample supply of cotton, and may expect that it will be available at a moderate price. The harvests of the world, with few exceptions, have been good, or are promising where not gathered; therefore an adequate food supply may be confidently anticipated. These are two very important favorable factors. The financial outlook is reassuring, the effects of the American panic of a year ago are passing away, money promises to be plentiful and the only adverse feature in this connection is the weakness of silver, which threatens to be a serious hindrance to the course of trade in the Far East.

"On the other hand, there is a spirit of restlessness in international affairs which is disturbing to all lovers of peace. We can only hope that the dread of the consequences of provoking an outbreak of war, which might involve all Europe and would necessarily paralyze commerce, will continue to restrain the European powers, as it has done for nearly forty years. However jealous we may be of the rivalry of other nations in manufacturing industries, it is the growth of strong commercial interests in these countries that provides the surest guarantee for the maintenance of peace.

"Assuming, then, that these factors will be favorable, what is the prospect for our great over-sea trade in cotton manufactures on its own merits? Is there any hope of our reaching the stupendous total of 1907—$550,000,000 value—again in 1909? I fear that it is hopeless. The pace during the three years' boom was much too rapid, and the depression that has overhung the trade this year may be fairly attributed to previous overtrading." There are some persons who would maintain that there can not be overproduction while there are in the Far East alone at least 250,000,000 people who wear cotton clothing but never use any Lancashire-made goods. As a theory that may seem plausible, but in practice, as you know, the rate of development of trade is governed by other considerations than the mere existence of potential consumers—by the extent to which inland markets are accessible and the material condition of the people, and by the capital available to take up and move the goods into consumption."

PROSPECTS AND SUPPLY OF COTTON.

12,438,000 BALES OF AMERICAN COTTON WILL BE WANTED FOR 1908-09.

Respecting the prospects of supply the outlook is exceedingly favorable, latest estimates of the American crop pointing to a yield of 13,500,000 to 14,000,000 bales. East Indian advices are satisfactory, but reports from Egypt confirm the lower estimates of yield, although the deficiency is to some extent offset by the heavy stocks carried over from last season. The prospects of supply from sundry sources are favorable.

For the season we estimate the requirements of Great Britain at 3,780,000 bales of 500 pounds, the consumption of the continent we put at the same as last season, viz., 5,720,000, and the United States, Canada, etc., we expect will require 5,150,000 bales, against 4,577,000 last season. The above figures make a grand total for Europe and America of 14,650,000 bales, against 13,987,000 bales last season.

To meet these requirements we calculate that India will supply 1,300,000 bales, Egypt 850,000, and sundries 400,000, say a total of 2,550,000 actual bales, equal to 2,485,000 bales of 500 pounds, leaving 12,165,000 bales as the quantity of American cotton likely to be used, say 12,438,000 bales of ordinary weight.

Assuming there is no change in weight as compared with last season, the foregoing figures will compare as follows with those of the previous three seasons:

	1908-9.	1907-8.	1906-7.	1905-6.
American	12,438	12,117	12,432	11,967
East Indian	1,300	1,068	1,299	1,288
Egyptian	850	856	871	815
Sundries	400	266	421	459
Total	14,988	14,307	15,023	14,529
Bales of 500 pounds	14,650	13,987	14,702	14,072

The above figures show that with a crop of 13,500,000 the stocks of American at the end of the season will be at least 1,000,000 bales larger than at the end of last season, and, therefore, there will be an ample supply of the raw material, not only to meet all the requirements of consumers, but to provide an effective safeguard against the mischievous manipulations of illegitimate operators.

Apart from the prospects of supply, while an improvement in demand has taken place in America, complaints are still received from the continent, and though more business has been put through in Manchester there is an absence of anything like activity, the course of affairs since the termination of the lockout being very disappointing, and it is stated that unless an increase in the demand for goods takes place, short time will have to be resorted to before the end of the season.

Under the present unsatisfactory trade conditions, the still existing heavy stocks of goods, and the abnormally low price of silver, any material increase in consumption, the large increase in spindles notwithstanding, can only be brought about by a decidedly lower range of values, on the basis of which the prospective surplus may be to some extent diverted through extraneous channels, absorption through which can only take place at abnormally low prices. And in the meantime it is well to remember that the great increase in consumption of the past few seasons was coincident with record margins of profit to producers, while the current season has seen profits reduced to a minimum if actual loss has not been incurred.

The prospects for the immediate future, therefore, do not warrant the expectation of any sustained improvement in prices. Efforts no doubt will be made by bull manipulators to bring about a higher level of values, but an advance can only be maintained by such a change in the prospects as to warrant the belief in a supply materially below current estimates.—*Ellison's Cotton Report.*

A PROGRESSIVE COTTON MANUFACTURING STATE.

The Bureau of Statistics of Labor, Massachusetts, has just issued its twenty-second annual report relating to the manufactures of the State for 1907. This report has been compiled upon a new plan and presents the aggregate returns from 5,671 establishments giving the amount of capital devoted to production, and wages paid during the year, value of products, etc. It shows that the manufacture of cotton goods in this State has progressed, in late years, more than that of any other industry in the State.

In treating of the increase in the value of manufactured products since the census year of 1905, the report says that "While it may be that some of the increase in value of goods is to be attributed to increased cost of materials, that it isn't altogether due to this source is evident by the increase in the average number of wage earners over 1905 from 26,836 to 34,539 in Fall River; from 17,855 to 21,834 in New Bedford, and from 29,303 to 30,738 in Lowell."

The gain in the value of manufactures of all kinds in the three well known cotton centers, Fall River, Lowell and New Bedford, amounts in the aggregate to $52,658,296, or 43.95 per cent. over 1905.

The report states that the total value of manufactured product in this State in 1907 was $1,364,431,255. Of this amount $233,025,182 was in boots and shoes alone. The value of the cotton goods produced was $193,276,574. Including cotton, woolen and worsted goods, the product value of textiles was $326,206,933.

The total average number of wage earners in the State were 539,982, of whom 367,471 were males and 172,511 females. Out of the number 102,425 were employed in cotton mills, 81,658 in shoe factories, 42,782 in machine ships, 31,037 in metal and metallic goods trade, 26,676 in worsted mills, and 24,076 in woolen mills.

Fall River still heads the position of being the largest cotton goods center in the United States. In that city there are forty-four cotton manufacturing companies, with a combined capital of $47,873,760 and 28,944 operatives.

RELATION OF WEATHER CONDITIONS TO GROWTH AND DEVELOPMENT OF COTTON.

(*Concluded from December.*)

AUGUST IS AN IMPORTANT PERIOD.

August, Fig. 6, may be considered a most important period in the life of the cotton plant. About the first week in this month the bolls begin opening. From the first bloom to the first boll is a period of about seven weeks. The plant continues growing and blooming until the new growth is killed by frost, but it does not bloom so luxuriantly as earlier in the season, since much of its vitality is needed to carry the bolls already formed to maturity. During this period of its life an abundance of light, well-distributed showers and warm sunshine is needed. If too much rain falls, the results are peculiarly disastrous; the weed will begin to grow rapidly, to the detriment of the fruit; the plant will cease to make new blooms and the squares already formed will drop; the bolls will decay on account of the accumulated moisture which they absorb; the fiber in the open bolls will be either beaten out or discolored.

PICKING SEASON NEEDS DRY WEATHER.

September and October are the months for picking, and, of course, dry weather is needed. Only sufficient moisture is then required to nourish the growing bolls and opening flowers, and much of this can be secured through the roots, provided the weather early in the season has been such as to cause the roots to penetrate deep into the soil. Under normal conditions the rainfall is very light during the months of September, Fig. 7, and October throughout the major portion of the cotton belt, affording fine opportunity for securing the matured crop.

YEAR OF GREATEST YIELD PER ACRE.

Figure 3 shows the yield of cotton for 1898—the year of greatest yield per acre—together with the rainfall for each month during the season. From this chart it will be seen that April had just about the normal amount of rain, while May was a dry month, its rainfall being 1.1 inches

less than the normal. June had just about the normal amount, and it was well distributed throughout the month. July had more than the average amount, as had also both August and September; but, coming after the plant had gotten a good start and was well worked, and being accompanied by a goodly number of sunshiny days, this proved rather a benefit to the crop.

A summary of the conditions is as follows: During the first ten days of April it was rather cool, freezing temperatures occurring in the northern portions of the belt and damaging frosts down to central Florida. Cotton made very little growth during the month, but the roots seemed to penetrate deep into the soil. May was particularly favorable for a rapid development of the plant. Rains were just sufficient to furnish the required amount of moisture and not to interfere with the thorough cultivation and cleaning of the fields. During June cotton made steady growth under the most favorable conditions. There was about the normal amount of rain, with just normal temperature. Considerable rain fell early in July, causing a rapid growth of the stalk, but these conditions changed before the 10th, and the dry weather following afforded ample opportunity to kill out the grass and weeds. Abundant sunshine gave renewed energy to the plant. Excessive rains early in August caused considerable apprehension among the planters, but more favorable conditions prevailed during the latter part of the month and most of September, and the result was the largest yield per acre ever recorded.

YEAR OF SMALL YIELD.

Figure 8 shows the relation between the precipitation and the yield per acre in 1901, a year of small output. The rainfall curve for April shows that it was a very wet month, nearly one inch more than the average. In addition to this the temperature was abnormally low, averaging 5 degrees below normal. Preparation for planting was delayed on account of the chilled condition of the soil. May was somewhat cooler than normal, with the rainfall over an inch above the average. Cotton that was planted made very slow growth; the fields could not be worked and became overrun with grass and weeds. The early part of June was wet, interrupting work and growth; the last half of the month was more favorable, with plenty of warm sunshine, but it was not until late in the month that the work of cleaning the fields was completed. July had about the normal amount of rain, but it came in the form of

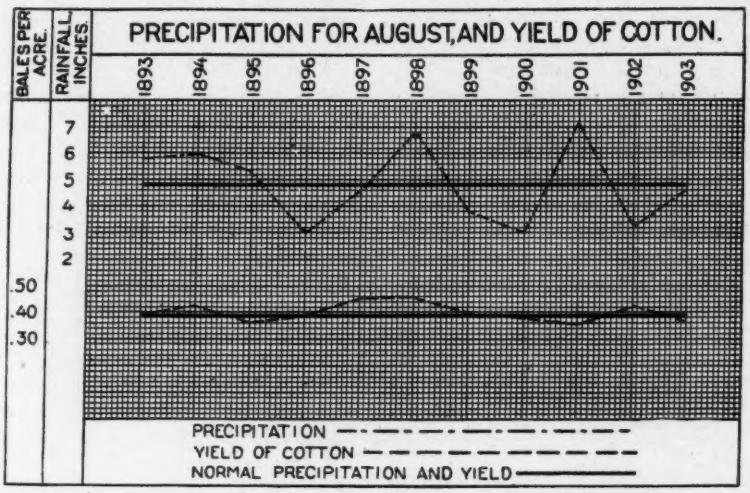


FIG. 6.

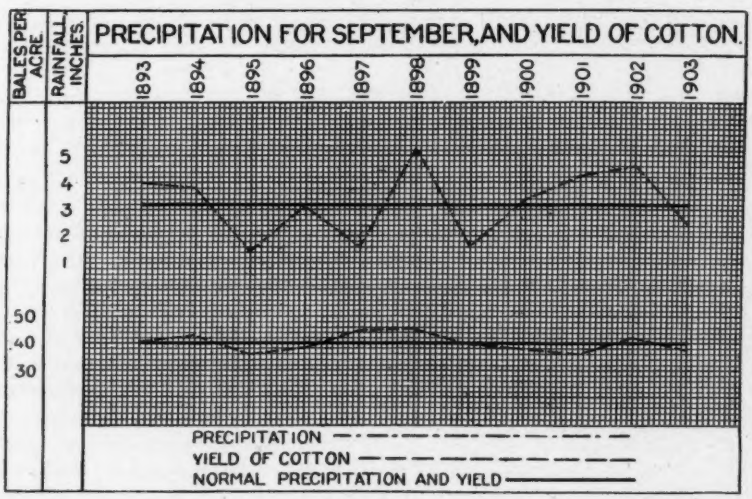


FIG. 7.

heavy downpours, followed by excessive heat, causing rapid shedding, rust, and bloom at the top. August had about normal temperature, but more than two inches above the normal rainfall. The accumulated excess of rainfall caused cotton to grow too much to weed, and the stalk was watery and unhealthy and the bolls failed to mature. Contrary to the rule, September was a cool, wet month, interrupting the ripening and gathering of the staple. On the whole there was a decided excess in rainfall and a deficiency of sunshine. From April to September there was a total excess of 7 inches in precipitation and a deficiency in temperature of 5 degrees.

SUMMARIES FOR COTTON SEASONS.

The year 1893 gave a normal yield of 0.39 bale per acre. The weather during April was most favorable; its temperature averaged only 3 degrees above normal, while the precipitation was just about the seasonal average. May was favorable as to temperature, but there was rather too much rain, about 2.5 inches in excess of the average; this rendered the soil too wet for cultivation and the fields became foul. The same was true as to most of June, while July had over an inch less than its normal amount of rain. The plant grew rapidly during May and June. Work was rushed and the fields were freed from grass early in July, and the abundant sunshine caused a rapid development of the bolls. August had more than the average amount of precipitation, but it was so distributed and interspersed with warm sunshine as to prove rather beneficial. Picking was interrupted many times by rain during September, but killing frosts did not occur until late and an average crop was harvested.

The year 1894 yielded more than the normal per acre, and, as is revealed by the charts, was a comparatively favorable season. April was warm, with about the usual amount of rain. May and June followed with less than the average. During these three months cotton developed rapidly and was in a condition to be benefited by the generous rains which came during July and August. September gave about the usual amount of sunshine and rain.

The year 1895 gave a small yield per acre; April was favorable, with about normal weather conditions, but from May to August, inclusive, the rainfall was far in excess of the normal, while the number of sunshiny days was small. As a consequence it was impossible to keep the fields free from weeds and grass, and the plant made too rank growth.

Another poor year was 1896, the yield being 0.02 bale less than the average. This shortage was evidently due to the accumulated deficiency in rainfall throughout the entire season, April being the only month with precipitation equaling the normal. The damage from lack of moisture was supplemented by excessive sunshine and abnormally high temperature. The growth of the plant was stunted early in its life and never recovered.

The yield for 1897 was nearly the same as that for 1898, and the weather conditions during these two years were very similar, except that the amount of rain during the latter was somewhat greater.

A normal crop was produced in 1899. The temperature averaged slightly above normal, and the rainfall somewhat below each month. The dry weather during April and May gave the plant such a start that it was enabled to withstand the drought later in the season. Its roots were forced down into the soil, from which moisture was secured during July and August.

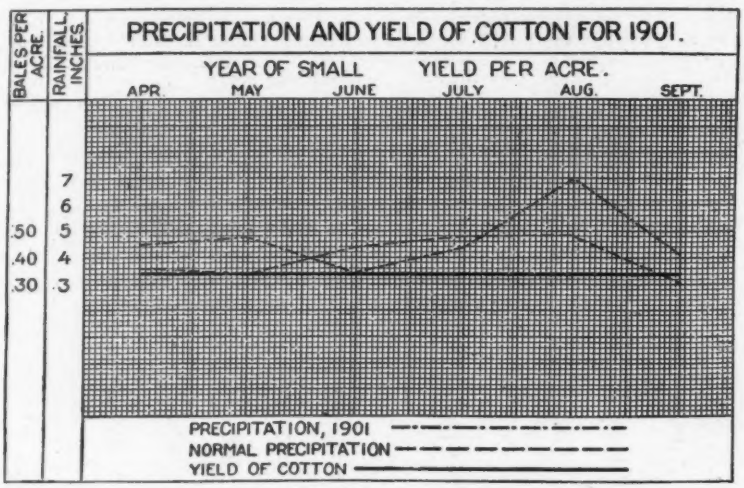


FIG. 8.

The crop of 1900 was below that of the preceding year. The heavy rainfall and low temperatures during much of April retarded planting until late. May had about the usual amount of rain, followed by what may be termed a wet June and July. August was drier than usual, with an average temperature and plenty of sunshine.

In 1902 the yield was normal. April and May were about normal both as regards temperature and rainfall. June, July, and August followed with deficiencies in precipitation, but the rains were fairly well distributed.

The year 1903 was only fairly favorable. Too much rain during May interrupted work at a critical period. There was about an average during each of the remaining months, but unevenly distributed. The crop became very grassy in many sections early in the season, and could not be properly worked and cleaned in time to make a full crop.

J. B. Marbury, U. S. Weather Bureau.

The removal of nitrogen from the soil, except in the case of legumes, by harvesting the crops depends upon the quantity of protein contained in the crop.

FROM ROVING INTO YARN.

RING SPINNING AND TWISTING.

The American builders of cotton machinery have led foreign manufacturers in the rapid development of the ring spinning and twisting frame, the most conspicuous features of this development being distinctively American. The inventor in this country in the field of this development has adapted himself to the spirit of the section in demanding highest speed and maximum production consistent with proper quality. It is an axiom among inventors that when through the application of certain determined principles an apparent maximum efficiency has been reached, the line of thought should be diverted to the application of those principles rather than expend energy obtaining a slight increase in efficiency, at the neglect of mechanical perfectness of application.

The advent of the gravity type of spindle solved the problem of spindle speed and gave to the textile trade a spindle capable of a higher speed than was demanded, and until a new principle is evolved, wherein a higher speed can be utilized, through a device or a machine which can be built at a cost which will permit its commercial success, the work of the cotton mill machinery builder will be in the development of the existing principles.

There is a very active and aggressive movement among the builders to perfect mechanical details and a careful study of the changes which are constantly being made will demonstrate the keen activity which prevails.

We take pleasure in illustrating for our readers portions of some machines with a view of indicating what is being done in the way of improvements in machines, and some new ideas that are being advanced.

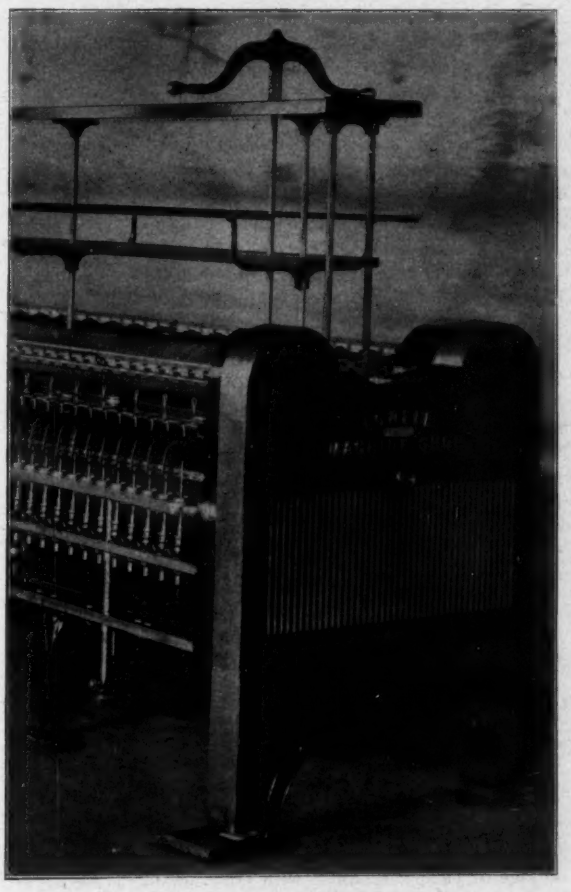
RING SPINNING FRAME.

The progressive machine builder has, in recent years, practically discarded his old patterns in their entirety, and in ring spinning frames, particularly, he no longer has a standard weight and general design of frame which he offers for all classes of work. Recent development has resulted in the increase of weight of stationary parts, the frame work, etc., and a new distribution of strength, etc., of the working parts, coupled with a higher quality of machine work with a special application of standardization of parts for the convenience of making changes and repairs.

The widths of frames proper are 36-inch, 39-inch or 42-inch, usually 36-inch. The spindle and ring rails are made of a heavier type than heretofore, the spindle rail being frequently webbed in its length to insure its rigidity. The feet of the frame are made adjustable for re-leveling, dispensing with wood shims and the necessity of removing screws from floor to relevel frames. The labor necessary to level up the old solid foot frame has frequently resulted in this important feature of taking proper care of the machine being neglected.

The main driving pulleys have outboard bearings, and the loose pulley is on a stud insuring its remaining stationary when the belt is on the tight pulley. The drums are made of two thicknesses of tin, reinforced by corrugated discs.

The three types of spindles generally used are the Draper, Whitin and McMillan; each have their advocates and the scope of this article will not permit a discussion of the relative merits of these spindles. The American builder will furnish either of these types of spindles. There are a variety of weights and sizes of spindles and due regard to conditions must be taken in the selection of weights of spindles.



RING SPINNING FRAME.
Lowell Machine Shop, Lowell, Mass.

The Woodmancy bolster case continues to be the most popular form of oiling device for the spindle base. There has recently been introduced a new form of oil snout cover known as the Lovejoy base, in which the cap is countersunk in the snout affording additional protection to it. The centrifugal clutch spindle is meeting with much favor. The introduction of the metal thread board and rail as a substitute for the old wood form is a distinct advance, allowing a nicety of thread guide adjustment not obtainable with the screw end form. The Walmsley thread board lifter which was a part of the wood thread board is applicable to the metallic board. This thread board has

a vertical adjustment useful for leveling and varying the distance from top of bobbin to thread guide.

But little attention has heretofore been paid to the distance between the top of the bobbin and the thread guide and the width of the thread board with reference to the pitch of the roll stands. Roll stands are made with 25 degrees, 30 degrees and 35 degrees pitch, straight and overhanging type. The pitch of the roll stand and the width of the thread board should be selected with reference to the yarn to be spun, there being many items entering into this selection. The distance between the thread guide and the top of the spindle is equally important. The manufacture of rings has been receiving especial attention in recent years resulting in the production of a higher finished and much better article.

In ordering spinning frames the possibility of the need of a larger ring in the future should be considered and rails bored to permit the insertion of a larger ring. Mills having occasion to use combination warp and filling frames, or spinning numbers of yarn on rings not adapted to them, exercise poor economy in not having a change of ring rails equipped with proper sizes of rings to be used in changing from warp to filling or to different numbers in a wide range.

In all ring spinning the tendency is toward using a larger diameter of ring and large diameter of bobbins. Much attention is now being given to the development of filling rewinders, and if success is reached will result in spinning filling yarn on rings not limited by the scope of the inside of the shuttle. The length of traverse is being lengthened with success, especially on coarse numbers. The adoption of large rings, larger diameters of bobbins and longer traverses is resulting in an increase in the gauge of frames. The modern ring frame for coarse knitting yarns has 3¼ and 3½-inch gauge, and large rings and large diameters of bobbins, separators being omitted. The increase in the gauge of frames permits the use of lighter travelers with consequent beneficial results.

Rings 2, 2⅛ and 2¼ inches are getting to be common sights in coarse yarn mill, as are 10x5-inch and 9x4½-inch speeder bobbins.

The double flange ring continues in popular favor but the single flange ring has many strong advocates as well as attractive features which can not be overlooked.

Practically no change has been made in the several forms of ring holders. The stamped metal holder secured by screws to the ring rail has its objections in screws working loose and not being readily cleaned, but has the advantage of being adjustable with reference to the center of the spindle without the use of three screws piercing the ring rail as necessary with the adjustable cast iron holder. The single ring can be made either fixed or adjustable in ring rail. When rings are fixed in ring rails the adjustment of the spindle to center of ring is at the spindle base, the spindle rail being bored sufficiently large to permit of this adjustment. The cast iron holder permits easy cleaning of rails, but has the disadvantage of adding to the weight of the rails. The wire traveler cleaner of the cast iron holder may be either exposed about the ring or concealed within the holder, the cleaning end passing out through the slot in holder. The stamped lip form of traveler cleaner on the plate holder is devoid of adjustment, and adjustment can be provided by the use of the Jenks traveler cleaner secured to a screw of the stamped metal holder or a screw especially provided in the case of the cast iron holder or single flange ring. Separators are of the common form and should be selected with care, avoiding the use of a blade wider than conditions demand. In cases where the gauge of the frame, length or traverse and weight of traveler used, is such to require but little width of separator a half round blade of narrow width can be used with success.

Lifting rods may be provided with cleaners and removable split bushings. Scavenger rolls are covered with denim and are made to extend well beyond the fluted boss of the steel roll. Rolls are made of the best crucible steel, fluted irregularly and have square joints. Front steel rolls maintaining high speed are provided with removable bronze bearings.

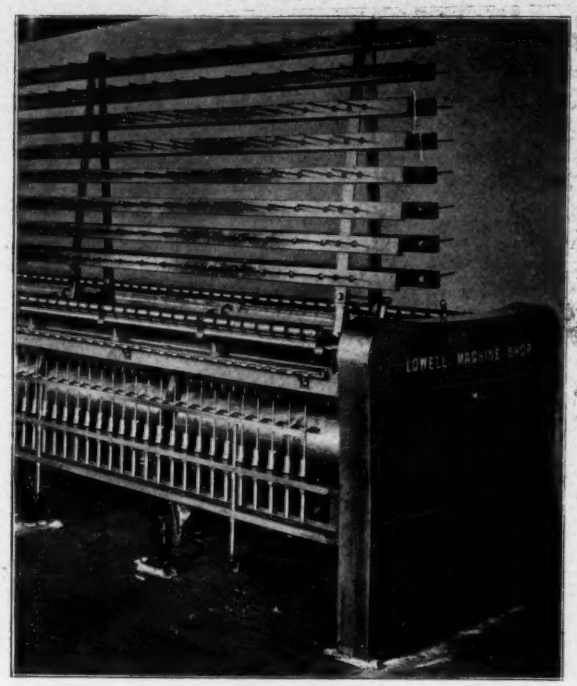
Lever screws are either solid or of the adjustable type, permitting adjustment without removing lever and a closer adjustment. Saddles are of the lubricating type and have been improved by the addition of an adjustable feature, allowing an adjustment to prevent the stirrup from coming in contact with steel roll, without bending the stirrup.

On ordinary classes of work the usual three lines of weighted top rolls are used. On fine work self weighted back and middle rolls are frequently used, the front roll only being weighted and the weight being of the yoke form at right angles to the frame, one weight serving two rolls on opposite sides of the frames. On frames equipped with these rolls revolving double cone clearers with an automatic reversing feature are used. Ordinarily the wood form of top clearer is used. The builder motion may be double, warp or filling, and is provided with a winding down step. Ring rails are provided with a doffing latch. The head end gearing may be either the all gear type or in part of the chain type wherein certain intermediate gears are dispensed with. The roving traverse rods have adjustable brass trumpets and the whole has a variable motion. Creels are made for single and double roving, and are double supported on ends. While in a general way mills installing new spinning frames should consider their present equipment with the view of maintaining its uniformity as far as practical, at the same time proper economy may demand the introduction of new ideas and a decided change in the details of the construction of their frames if necessary to enable them to get maximum results and to compete with their neighbors who are adopting advanced types of machinery.

RING TWISTING FRAMES.

The frames illustrated in connection with this description are built for either wet or dry twisting and of a large variety of ring sizes up to 5 inches or larger in special cases. Many features common to ring spinning frames such as adjustable feet, ring oiling, drum bearing, etc., as referred to in the description of ring spinning frames form a part of the valuable features of the ring twister. The creels are usually built for four ply with eight lines of spools.

The position of the creel pins and the spacing is very important. The latest form of creel is constructed entirely of metal and creel pins at their base have small hemispherical washers which prevent the heads of spools from coming in contact with the slats. There has recently been built some coarse twisters having a horizontal rod parallel with



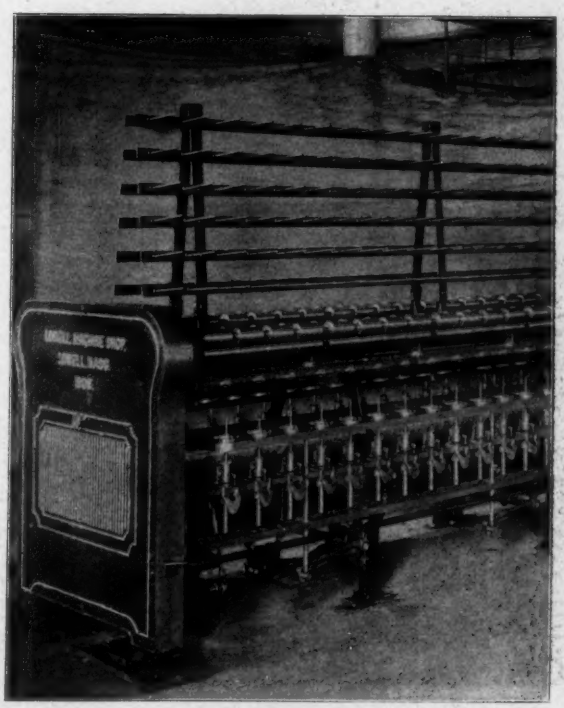
LIGHT DRY RING TWISTER.
Lowell Machine Shop, Lowell, Mass.

the creel at its base, under which the ends from the spools are passed before going to the thread guide on the traverse rod. This arrangement has been further improved by iron brackets carrying a porcelain guide about which the ends are carried. The rolls for dry twisting are either single line top and bottom rolls or the bottom line may be double. In cases where the rolls are run at a high speed the bottom line of rolls is provided with removable bronze bearings.

In wet twisting the rolls are brass covered. The water trough used in wet twisting is brass and slightly pitched to one end of the frame to insure drainage. The drainage opening is provided with a hollow plug, the upper end of which is the water line of the trough which prevents overflow. The trough is provided with a drainage pipe and valve, and should be piped to the outside of the mill or to surface drain. The water trough is usually provided with two glass rods, either or both of which can be used. A new device in this connection consists of a revolving hollow brass roll instead of the stationary glass rods. In addition to this roll there is a brass rod which slightly deflects the yarn from its path to the roll and relieves it of a part of the water. This device can be raised and lowered from the trough as in the case of the glass rods, the roll remaining in its bearings. The new metallic thread board with an effective adjustable porcelain thread guide has solved the old difficulty of warped thread boards and grooved brass thread guides.

In the wet twisting the distance from the thread guide to the top of spindle is materially greater than in dry twisting and ring spinning, and the diameter of the ring is made slightly smaller than in dry twisting for the same number of yarn. The thread board has a vertical adjustment. Various forms of wet twister rails have been designed with varying degrees of success. These consist of the common U shaped cast iron rail into which rings are placed in brass plate holders secured to each by brass screws. This form was improved upon by increasing the gauge of the frame to allow the holes in the ring rail to be bored to a diameter which would give the ring a ½-inch clearance in the hole below the holder. Another form consists of a made-up rail of tongue-shaped individual brass ring holders into which the rings are forced and the holders held by horizontal bars at the rear. The new form of rail here shown is of rolled brass, polished, with rings forced in, allowing ample space between the ring and the sides of the rail for removal of travelers from the under side. It is neat, stiff and readily cleaned. The rings on the wet twister are of the vertical type which is the same as on rings 3½ inches and larger for dry twisting. Mills using the same frame for wet and dry twisting should have a change of ring rails to avoid using upright rings on dry work.

Ring rails having large rings may be provided with wick oiling device for oiling the bottom of upright or flange rings. The modern twister spindle is made on the gravity or self-balancing principle, there being several weights of these spindles which should be carefully selected with regard to the work to be performed. On coarse work, requiring heavy spindles, knee brakes are frequently specified, though many overseers prefer to have twister tenders wear leather knee pads instead of having knee brakes on the spindles. If these brakes are used the frame should be provided with a horizontal truck guard as shown in the illustration to prevent trucks from striking the brakes. The drums of the dry twisters are usually made 8 inches in diameter. In some instances there are two lines of drums, each side of frame twisting independently. Except in special cases the twister bobbins are made with



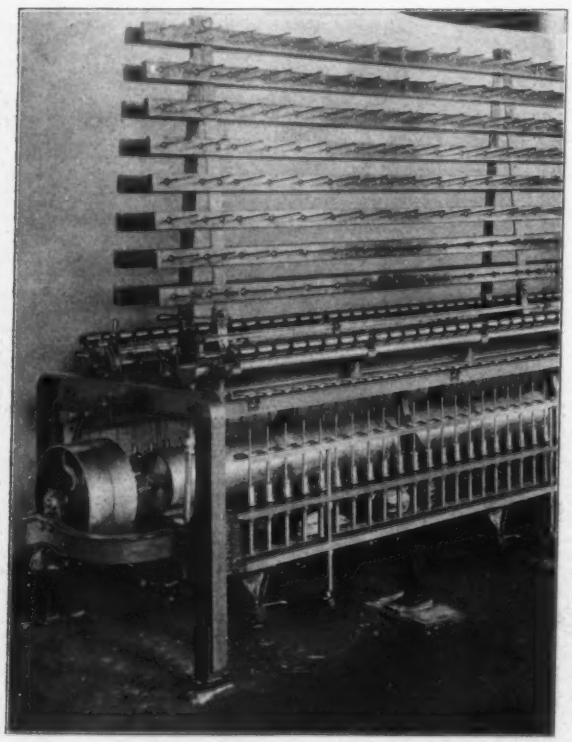
HEAVY DRY RING TWISTER. METAL CREEL. KNEE BRAKE.
Lowell Machine Shop, Lowell, Mass.

base only and with swelled tip, the top head being omitted. By the use of a special form of builder the bobbin with the flat base is built with a cone only at the top, instead of cone top and bottom. There are several forms of building yarn on bobbins adapted to the different conditions.

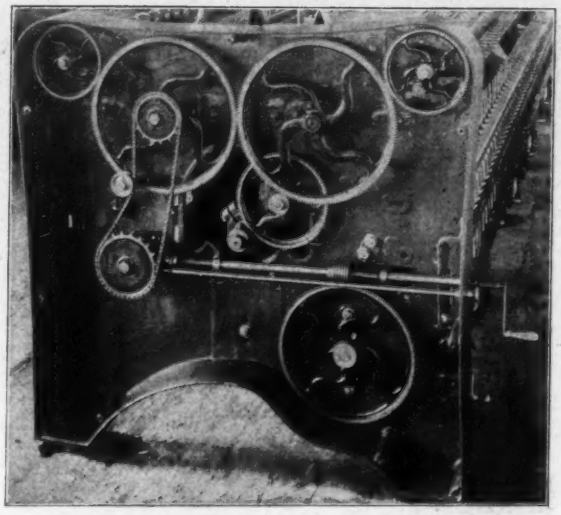
In starting up wet twisters when the traverse is at the bottom, it is desirable to "slack off ends," and we show the open end of the frame having a new arrangement wherein the heart shaft is disengaged by a clutch operated by pulling a handle on a small horizontal shaft connection, and with a removable key the heart shaft is moved to any desired position.

Ring twisters are built 39 and 42 inches, dry and wet respectively. In mills having both twisters and ring frames the symmetry of the arrangement of the room can be frequently maintained by making twisters the same length as the spinning frames, though long twisters are more impractical than long ring spinning frames, and the former should in a general way be kept within 30 feet. There are a number of variations from the standard specification for ring twisters for special kinds of work, which space will not permit us to show. There has been a marked improvement in the building of this machine, and many new ideas as to proper specifications for twisters for different kinds of work have been developed and tested out, so the manufacturer who fails to examine into what is transpiring in this field of development before determining the details of his improvements is neglecting an opportunity to get better returns on his investment.

There exist in many mills serious drawbacks as a result of a lack of intelligence and information about the design of bobbins and carelessness in ordering them,



WET TWISTER.
Lowell Machine Shop, Lowell, Mass.



WET TWISTER. GEARING HEAD END.
Lowell Machine Shop, Lowell, Mass.

and seeing that they are properly made. A new mill may start with a properly designed bobbin and gradually allow different lots of new bobbins to depart in size and other essential features until they cease to be adapted to their requirements. In selecting the design and the material for a twister bobbin give especial attention to all conditions. The diameter of the barrel is of first importance, then the form of base and head, if the latter is used. In the dry twisting the base may be two-ply, glued and pinned, the grain of the two-plies crossing. If solid stock is used for base, it should be wired to prevent splitting in case of large diameters. Solid stock for base is essential for wet twister bobbins and is usually dogwood. The single slot is recommended in base and this may be protected with two metal driving pins or a Dixon driver consisting of a metal binding about the slot. This device has been much improved and is very effective. Small sizes of twister bobbins may have metal bound bases. In special cases twister bobbins are enameled and should always have two good coats of shellac. Bobbins should be reamed out as often as necessary to insure their fitting.

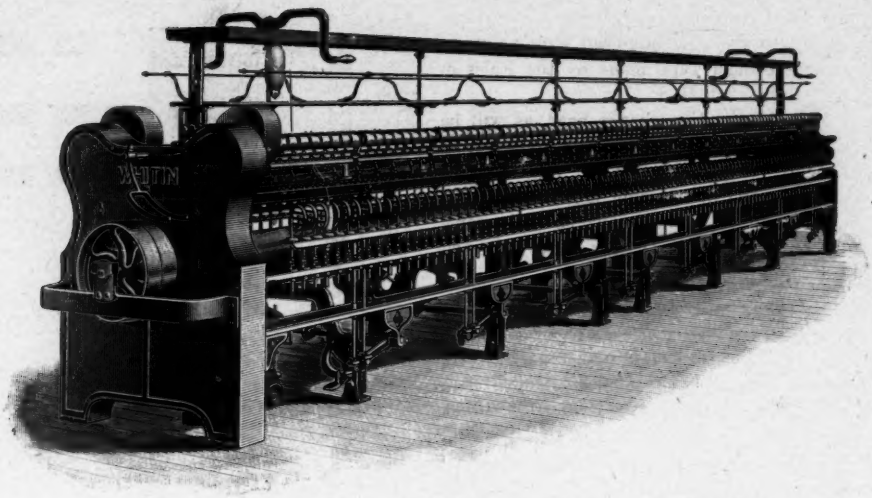
RING SPINNING FRAME.

The ring spinning frame that we herewith illustrate has been particularly designed to embody strength and rigidity with neatness of outline and accuracy in workmanship. It possesses several advantages that are appreciated by all who have used it.

The framing is substantial with angle roll beams and spindle rails on the double web-rail principle with bridge pieces between sampson supports. The head end is of the well known "boxed" style, very rigid and of pleasing design.

The feet of the foot end and of the sampsons are adjustable, thereby adapting themselves readily to the floor levels, without the necessity of using unsightly wooden blocks.

All twist and builder-motion gearings are located in the closed boxed end and operatives are entirely protected from accidents. The gearing is readily accessible for clean-



RING SPINNING FRAME.
The Whitin Machine Works, Whitinsville, Mass.

ing or changing by simply removing a panel. The cylinder and jack gears are made of coarse pitch which result in few breakages. The gears of both the twist and draft motions are machine cut, thus ensuring smooth and easy running. A change in either the draft or twist is effected by a single adjustment in each case and a wide range is afforded by the different combinations.

Liability to an accident to an operator while changing the twist gearing by the unexpected starting of the frame is entirely avoided by the use of the Owen automatic "locking device" of the driving belt. The device is applied to the inside of the boxed end, entirely out of the way.

When either or both of the removable panels are open, the belt shipping mechanism is locked so that it is impossible to start the frame in motion until the panels are replaced in their closed positions.

The fluted rolls are made of the best roller steel and are irregularly fluted to avoid cutting the top rolls. The fluted boss on either side of the roll stands is drawn half an inch away from the bearing to avoid carrying oil to the top rolls. Either long or short boss rolls may be had as desired. The top rolls are usually furnished covered, either shell or solid, and weighted with any saddle preferred. Top roll clearers may be either the stationary or revolving style as preferred.

The roll stands are of such width as to insure long life to the neck of rolls. The cap bars are arranged to work independently, the finger at each roll bearing being divided so that when the bar is thrown back, only its own particular set of rolls is affected. Ample space is left between the halves of cap bar fingers over the roll bearings for oiling.

The Owen "roving traverse" motion is used. It is adjustable as to length of traverse and has a variable motion to prevent liability of top rolls becoming creased at any point. The trumpet rod is of steel with adjustable brass trumpets.

The locking device is applied for locking the ring rail when doffing. It is located so as to be conveniently operated by the foot of the spinner, and consists of an arm pivoted to the head cross shaft lifting arm in such a way that when the lifting arm is depressed the locking arm locks the ring rail at its lowest point automatically; a further slight depression releases the arm which drops back, and disengages the ring rail.

STIRRUP ADJUSTMENT SADDLE.

The stirrup adjusting saddle for top rolls for spinning frames which we illustrate, is a new device to cotton manufacturers. The advantages claimed by the maker are to the effect that by the use of a moveable notch in the saddle the stirrup can be placed exactly where it is wanted, thereby

STIRRUP ADJUSTING SADDLE.
Dixon Lubricating Saddle Co.,
Bristol, R. I.

doing away entirely with any trouble of the rolls grinding into the stirrup, and by doing away with friction caused by the stirrups coming in contact with the steel rolls, a considerable saving is made in power. The rolls can be set to accommodate different staples of cotton without having the steel rolls grinding into the stirrup, as, by using the moveable notch in the saddle, the stirrup can be placed in the same relative position as before the rolls were set; besides a more uniform weight on the rolls can be obtained.

The value of humus to the cotton producer was brought up some years ago when we adopted the no-fence law in South Carolina, where the old snake rail fence had been for years and where there were a lot of weeds. The seeds from the weeds had fallen back on the land, and when the fences were moved away it was a notable fact that the rows next to the fence produced a better crop than the others. The humus is necessary to the soil, but you can get it cheaper in the end, and almost every farmer who is clinging to the old idea of putting his seed on the land is doing so at a very high cost to himself.

GEARING FOR RING SPINNING FRAME.

The draft and twist formulas and three illustrations given herewith apply to the new box-head ring spinning frame as well as to the older type made by the Fales & Jenks Machine Co., Pawtucket, R. I.

The lay gear or builder motion change gear, as will be noted by reference to the box head gearing drawing, is much more conveniently located than on the older type of frame, being enclosed in the upper right hand part of the head with the twist gearing. This gear, which is the same as a cylinder gear or a twist change gear, may be varied from 16 to 60 teeth, according to requirements.

DRAFT FORMULAS.

f = front roll pinion. c = crown gear.
d = draft change gear. b = back roll gear.
m = diam. of front roll. n = diam. of back roll.

$$\frac{c \times b \times m}{f \times d \times n} = \text{draft.}$$

$$\frac{c \times b \times m}{f \times n} = \text{draft constant.}$$

$$\frac{\text{draft constant}}{\text{draft change gear}} = \text{draft.}$$

$$\frac{\text{draft constant}}{\text{draft}} = \text{draft change gear.}$$

EXAMPLES.—

front roll pinion 30 t. crown gear 84 t.
draft change gear 24 t. back roll gear 84 t.
diam. of front roll 1 in. or 8-8 in. diam. of back roll ⅞".

$$\frac{84 \times 84 \times 8}{30 \times 24 \times 7} = 11.20, \text{ draft.}$$

$$\frac{84 \times 84 \times 8}{30 \times 7} = 268.80, \text{ draft constant.}$$

$$\frac{268.80}{24} = 11.20, \text{ draft.}$$

$$\frac{268.80}{11.20} = 24, \text{ draft change gear}$$

TWIST FORMULAS.

c = cylinder gear. j = jack gear.
t = twist change gear. f = front roll gear.
e = circum. of front roll. r = ratio cyl. to whirl.

$$\frac{j \times f \times r}{c \times t \times e} = \text{twist per inch.}$$

$$\frac{j \times f \times r}{c \times e} = \text{twist constant.}$$

$$\frac{\text{twist constant}}{\text{twist change gear}} = \text{twist per inch.}$$

$$\frac{\text{twist constant}}{\text{twist per inch}} = \text{twist change gear.}$$

EXAMPLES:-

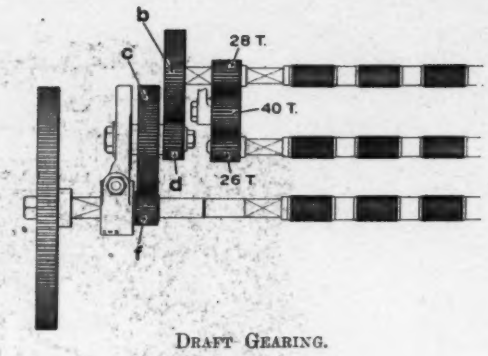
cylinder gear 50 t. jack gear 60 t.
twist change gear 16 t. front roll gear 112 t.
circum of 1 in. front roll 3.1416 in. ratio 7 in. cyl. to ¾ in. whirl 8.24

$$\frac{60 \times 112 \times 8.24}{50 \times 16 \times 3.1416} = 22.03, \text{ twist per inch.}$$

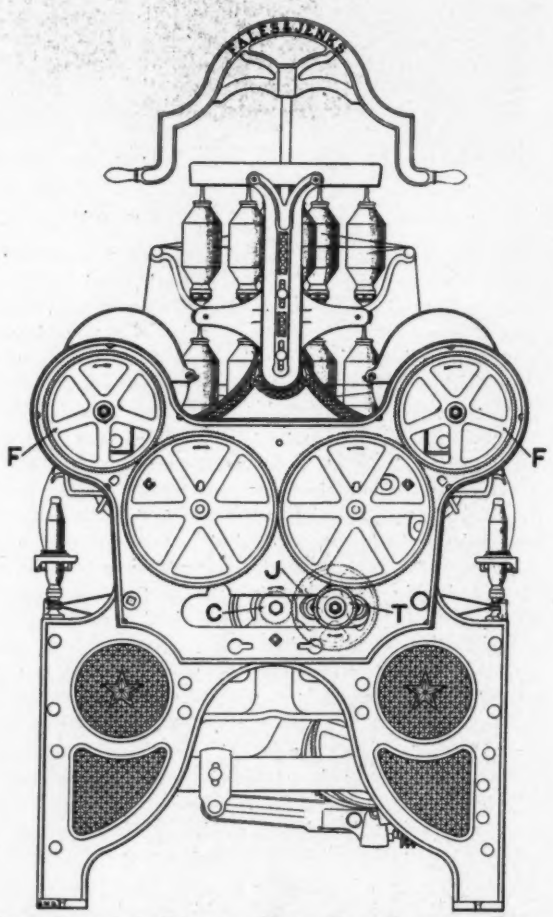
$$\frac{60 \times 112 \times 8.24}{50 \times 3.1416} = 352.51, \text{ twist constant.}$$

$$\frac{352.51}{16} = 22.03, \text{ twist per inch.}$$

$$\frac{352.51}{22.03} = 16, \text{ twist change gear}$$



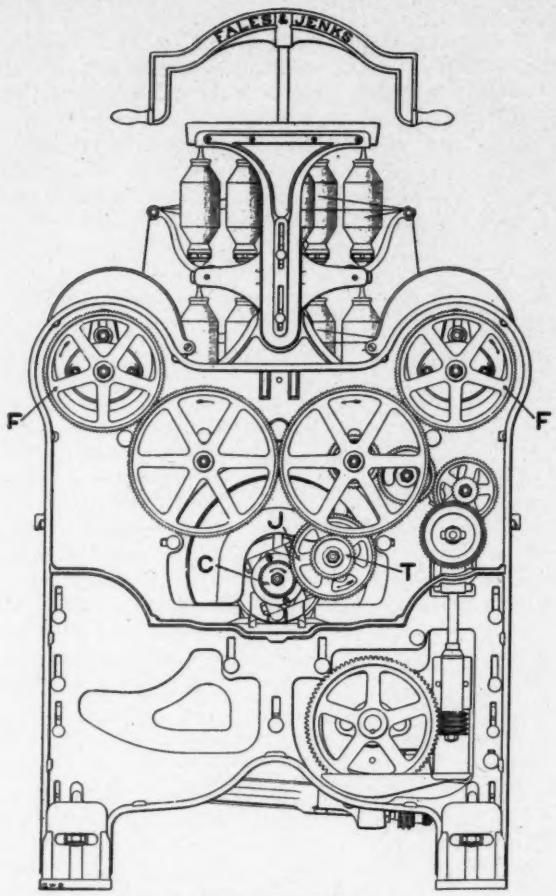
DRAFT GEARING.



RING SPINNING FRAME. HEAD END SHOWING TWIST GEARING.
Fales & Jenks Machine Co., Pawtucket, R. I.

The ribbon looms in France mostly in use, are the jacquard and tambour types. There are some American-made looms to be found, but not many; there is an American loom used in the weaving department of the Saint Etienne manual training school.

Cottonseed meal, when fed in conjunction with good corn silage, may be fed to the extent of from five to six pounds per cow daily without affecting the health of the animals. Indeed, such a ration appears to keep cows in an unusually good state of health.



RING SPINNING FRAME.
BOX HEAD SHOWING TWIST GEARING.
Fales & Jenks Machine Co., Pawtucket, R. I.

SELF-ACTING MULE.

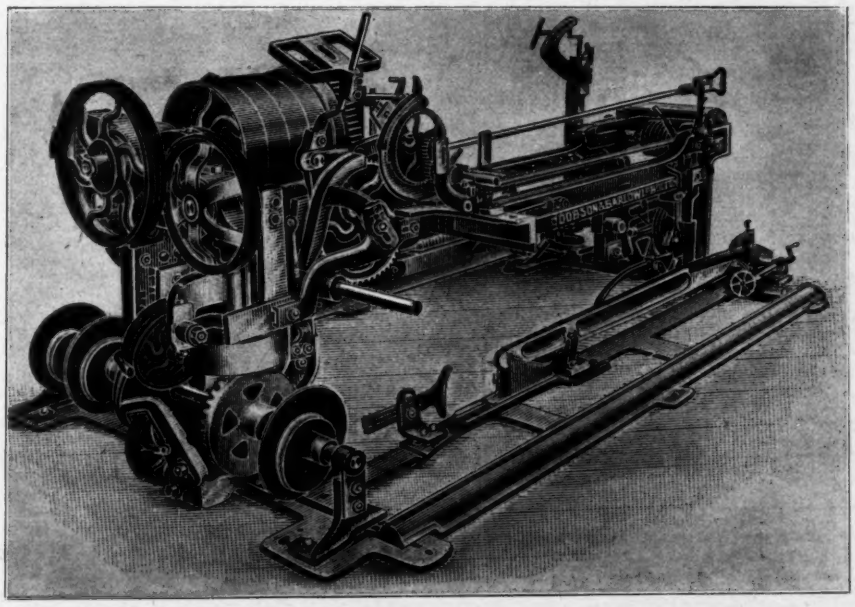
We show in this connection an illustration of a self-acting mule for spinning cotton for any counts of yarn. This mule is made for different drafts from 56" to 72", according to the counts to be spun.

The different motions and change places are most easy of access, all jointings are planed or milled; and all parts are interchangeable, being planed, tongued, grooved, and finished to template by special tools.

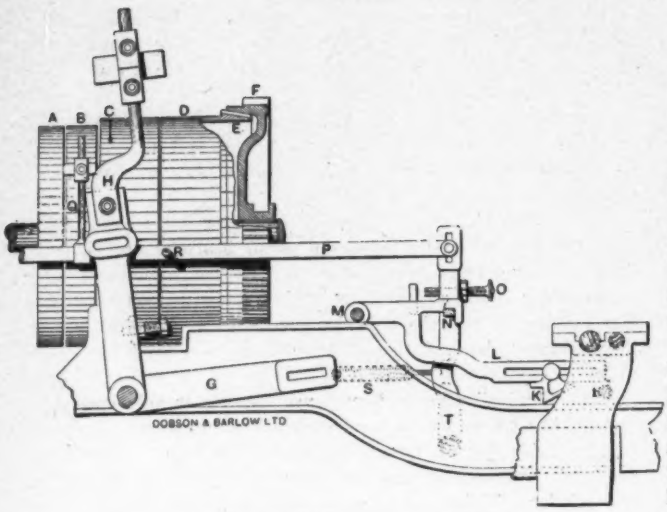
The headstock, middle slips, copping motion, outside quadrant support and drawing-up scroll bearings are all fixed on long extra-strong cast-iron planed foundation plates which combine the whole in the most rigid manner. The driving or rim shaft is the lowest made, allowing a longer strap to be used, thereby securing smoothness in running.

The "duplex" driving arrangement, shown in the illustration, has an automatic band governor or strapping motion, suitable for all counts of yarn. The cop bottoms are made automatically, no assistance being required from the minder. Tight and regular winding is also ensured during the building of the cop bottom. For fine counts of yarn, which require the least possible weight on the fallers the motion shows a sensitiveness to the difference in tension of the yarn, and with an automatic nosing motion, a perfectly formed cop nose is attained, and a tight and regular winding insured throughout the entire length of a cop. No alteration is required for any counts of yarn. The quadrant arm is dispensed with, thus preventing breakages in the mules when a quadrant band breaks. The machine has a safety locking motion, which prevents all possibility of two motions coming into gear or acting at the same time.

For spinning fine counts the following additions are made: An after-stretch motion; winding motion, referred to below; roller turning motion whilst twisting at the head; double speed driving device; and faller shafts on anti-friction bowls.

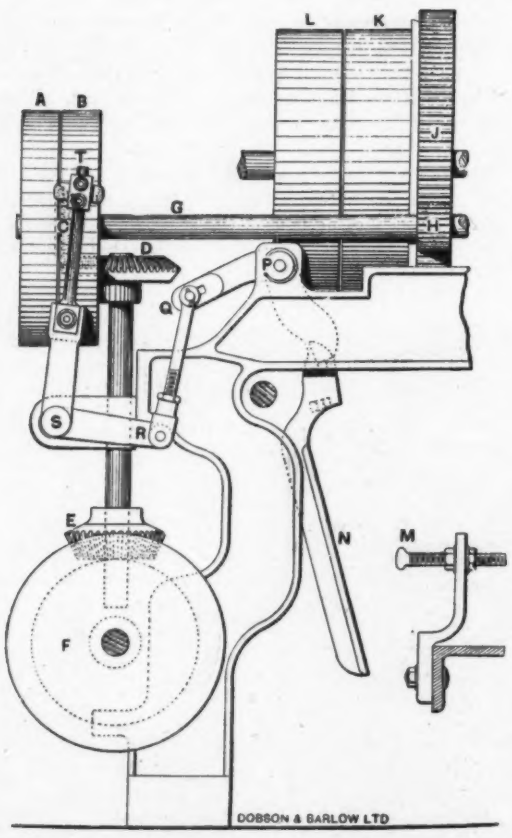


SELF-ACTING MULE RIM AT BACK AND "DUPLEX" DRIVING ARRANGEMENT.
Dobson & Barlow, Represented by Stoddard, Haserick, Richards & Co., Boston, Mass.



WINDING MOTION ON A MULE.

A—Fast Pulley, B—Loose Pulley, C—Loose Rim Shaft Pulley, D & E—Fast Rim Shaft Pulley, with leather cone, F—Backing-off Cone Wheel, G & H—Strap Fork Lever, J—Stud and Bowl on Faller Plate, K—Incline Tumbler, L—Latch Lever, M—Centre for Latch Lever, N—Projection on Upright Lever, O—Adjusting Screw, P—Strap Fork Link, Q—Strap Fork R—Pin, S—Spring, T—Upright Lever.



DRAWING-UP AND BACKING-OFF MOTION ON A MULE.

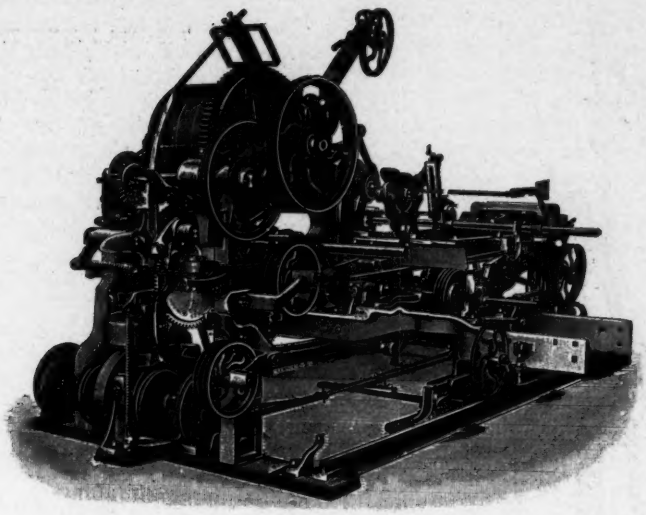
A—Fast Pulley for driving backing-off, B & C—Loose Pulley and Bevel for drawing-up, D—Top Bevel for upright drawing-up shaft, E—Bottom Bevel for upright drawing-up shaft, F—Scroll Shaft Bevel, G—Backing-off Shaft, H—Backing-off Pinion, J—Backing-off Cone Wheel, K—Fast Rim Shaft Pulley and Leather Cone, L—Loose Rim Shaft Pulley, M—Adjusting Screw on square for changing drawing-up, N—Drawing-up Lever, P—Centre of Drawing-up Lever Q—Connecting Link, R—Strap Fork Lever, S—Centre for Strap Fork Lever, T—Strap Fork.

The winding motion referred to above when spinning fine counts has for its object the giving of an increased motion to the spindle previous to the carriage getting in, in order to wind the slack yarn that results through the copping faller lifting. Snarls and cut yarns are consequently avoided. It is arranged so that it can be put into action up to within eight inches of the finishing of the stretch. By referring to the illustration its action, will be understood as follows: As represented in the drawing the driving strap is supposed to be on the loose pulley *C*, and the winding strap on the loose pulley *B;* drawing-up is taking place and moving the carriage in. When the action is almost completed, a stud and bowl *J*, fixed on a portion of the carriage, comes into contact with the incline *K* on the lever *L*, and lifts it up. As the lever which is centered at *M*, is raised, a portion of it sets free a projection *N* on the lever *T*, which it has previously held in position, and immediately this happens the spring S pulls the lever forward. The upper part of this lever is connected by means of a link-bar *P* to the strap fork *Q*, and its movement consequently changes the strap from the loose pulley *B* to the fast pulley *A;* at the same time the pin *R* on the bar *P* moves so that it is almost in contact with the strap fork *H*. When the driving strap is changed from *C* to *D*, it moves the bar *P*, by means of the pin *R*, back to its original position, and in doing so the winding strap is also moved from *A* to the loose pulley *B*.

We illustrate herewith a drawing-up and backing-off motion by strap used in connection with this mule specially arranged for spinning counts from 120's to 300's. Its action is of a simple character, and easily understood from the drawing. When the motion is in the position shown, the strap will be on pulley *B*, and through its connection with the bevel *C*, it will be drawing up the carriage by means of the scrolls on *F*. As the carriage moves in, an adjusting screw *M*, fixed on the carriage square, comes into contact with the lever *M*, and it moves in the same direction. This has the effect of changing the strap from the drawing-up pulley *B*, on to the backing-off pulley *A*, which is keyed to the shaft *G*. The amount of strap on the drawing-up pulley can be adjusted according to the speed required, the regulation being effected by an inclined bayonet, coming underneath the stop-rod handle and allowing the strap to move gradually on to the fast pulley.

SELF-ACTING MULE.

The self-acting mule which we illustrate in connection with this article is one with which our cotton manufacturers are familiar for its many advantages. It is strong and simple in construction, which enables the machine to be made unusually long and to run at a high speed with few breakages and stoppages. Both rim pinion and the speed wheel are change wheels, and are placed in front of the headstock where they are easily reached. The governing, nosing and anti-snarling motion, work automatically, and require little or no attention from the operator. The machine has a compound driving motion, which compels the carriage rollers and spindles to start simultaneously at the commencement of the draw. It has a catch-box of large diameter on the back shaft in lieu of the "mandoza" or drag lever, which avoids breakages caused by wheels gearing in the same place. The cam shaft is so arranged that the changes can not possibly be upset, and cams are provided suitable for all counts up to 200's or finer.



SELF-ACTING MULE.

Asa Lees & Co., Represented by Wm. Firth Co., Boston, Mass.

A twist wheel, if a twist motion is desired, is placed on a tin roller shaft, so as to avoid the inaccuracy of twist caused by a slack rim band. This twist motion is especially advisable in the construction of a machine for fine spinning, for which purpose, a jacking-out or ratching motion is added to cause the carriage to run out very slowly during the last few inches. A nosing motion is provided, that is worked from a copping rail so as to wind a little tighter at each draw, and thus compensate for the taper of the spindle.

This mule is provided with a compound driving motion by which not only the spindles, but also the rollers and carriage are driven by the rim band so that all three motions can start simultaneously, thus avoiding the cutting of the yarn and any irregularity in twist.

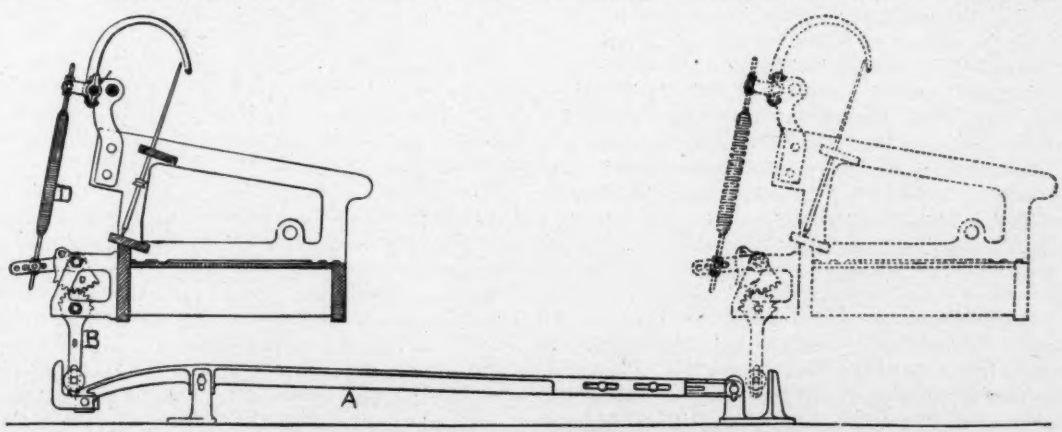
MULE TENSION MOTION.

The tension motion that we illustrate in this connection is used on the Curtis H-Pattern mule for cotton, made by John Hetherington & Sons, Manchester, England.

The rail *A* having a shoulder or rise at the front end can be regulated in height. During the inward run of the carriage the bowl at the end of lever *B* must run over the shoulder of the rail, and in doing so puts tensions on the yarn through the spring *D*; the greatest tension being whilst winding on the shoulder of the cop. As the carriage runs in and the faller rises, the tension is diminished until it ceases altogether when the carriage is near the beam.

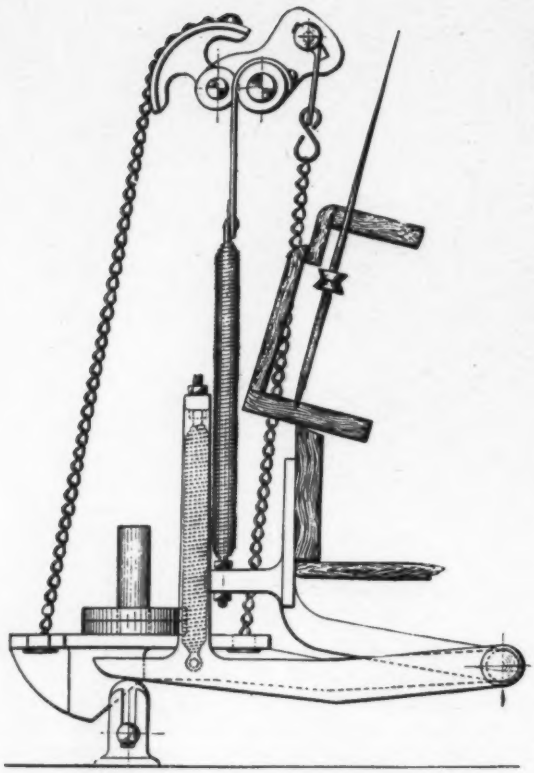
A TENSION MOTION FOR A COTTON MULE.

The tension motion shown in the accompanying illustration, is particularly designed for the Hetherington type of mule. It is arranged to work in conjunction with the ordinary weighted lever, which hitherto has been relied upon to relieve the tension on the yarn during backing-off and when commencing winding. The action of the latter, when acting alone, is considered too abrupt; that is, when the weight is taken off the counterfaller by the incline of the lever coming into contact with the usual projection bowl, the change is too sudden, and is liable to strain the yarn unduly. It is in connection with this weighted lever that the arrangement referred to is applied. Strictly speaking



TENSION MOTION. CURTIS H PATTERN MULE.

S. C. Lowe, Boston, Mass.



TENSION MOTION OF THE HETHERINGTON MULE.
S. C. Lowe, Boston, Mass.

it is also a relieving device, but only so far as to cause the weight to be put on and taken off gradually. The arrangement consists of an auxiliary lever, pivoted upon the same stud that carries the ordinary weighted lever and works alongside it. At the opposite extremity to the fulcrum of the lever is a helical spring, which is secured at one end to a vertical arm, and at the other to a stud on the ordinary weighted lever. In this way it will be observed that the spring referred to practically suspends the weighted lever during the time the backing-off takes place.

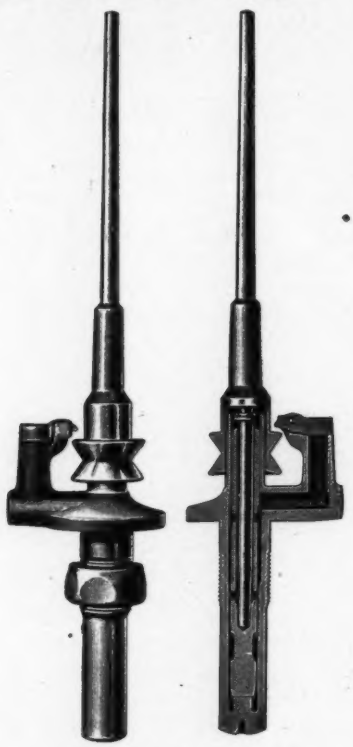
The drawing shows the carriage of the mule within a short distance of completing its outward run, and when the weight is about to be taken off the faller for backing-off. By the time the carriage completes its outward run the weight will be entirely suspended by the spring, and partially retained by it until the backing-off is completed, and the carriage has traveled inward about 12". It is during this latter part of the journey that the weight is gradually allowed to come upon the faller. The advantage to be derived from using this auxiliary tension arrangement is that heavier weights can be used at the proper time, which means firmer winding without undue strain on the yarn. It also admits of a wider range of application to suit classes of spinning.

Yarns subjected to a preliminary and simple course of treatment of mercerization without tension are particularly suited for the manufacture of hosiery goods; they lose their harshness and fray less readily by friction, features of recommendation that are absent in the case of unmercerized yarn.

THE GRAVITY SPINDLE.

The reputation that the spindle which we herewith illustrate, known as the "gravity spindle," has acquired is based largely upon the fact that it is simple in construction and durable. Some of the spindles have been run at a speed of 12,000 turns a minute for several years without any perceptible evidence of wear. The whole structure of bolster, spindle, bobbin, and its yarn load rests upon a solid pin milled into the bottom of the bolster case.

To prevent the escapement of oil which the high speed of the spindles naturally forces out under the whirl, a small ring, extending a short distance into the bolster, is driven onto the spindle under the whirl. When starting up new spindles, the oil chamber and tube should be completely filled, and afterwards, in order to get the best results, a little fresh oil should be added every week.



GRAVITY SPINDLE.
The Whitin Machine Works, Whitinsville, Mass.

An examination of the accompanying illustration shows that the oil is admitted to the spindle through two small ducts. Thus the main supply of oil is not agitated by the motion of the spindle, and all dirt settles at the bottom of the bolster case.

The spindle is ordinarily built to drive the bobbin from a cone at the base of the spindle blade, and by this method of driving, the interior of the bobbin is not materially cut away, and its strength is maintained.

The same spindle can be used for either warp or filling yarns, a convenience which will be appreciated by those whose work calls for frequent changes.

The superiority of this spindle in running is largely due to the arrangement of the parts of the bolster and its case opposite the center of the whirl. A sliding fit between the interior and exterior cylindrical surfaces of the bolster, respectively, allows the foot of the bolster sufficient play

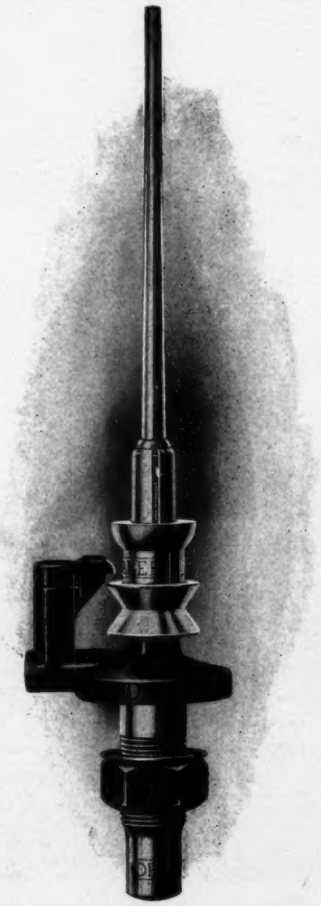
to obviate any tendency to gyrate. Thus it will be seen that with these surfaces arranged as described, and with the band pull at or near the middle of the same, the spindle is kept in a vertical position at all times, as the power of the band is exerted to bring these cylindrical surfaces in alignment, even when the unbalanced load tends to throw the bottom of the bolster out of its central relation. Thus the spindle remains true with the ring; the band pull does not deflect the spindles, whether tight or loose; and no influence is felt on the spinning of yarn by it. The position of the whirl is such that an even pressure is exerted upon the whole length of the spindle bearing.

The woodmancy doffer guard, or latch, as it may be called, consists of a combined spindle-stop and oil-cover firmly pivoted to the oil-tube in such a manner that the spindle when dropped into the bolster is locked automatically without the use of a wrench or other device. It will be seen, however, that the spindle can be removed only by tilting the latch until the spindle is released from the stop.

A CENTRIFUGAL BOBBIN CLUTCH.

The accompanying illustration shows the new Rabbeth centrifugal bobbin clutch for spinning frame spindles made by the Draper Company, Hopedale, Mass.

With this clutch the bobbin fits loosely and may be placed with less labor than the bobbin which has to be jammed down into place. By its use the necessity for doffing is very considerably reduced. The loose pieces on the whorl are thrown out by the centrifugal effect of the spindle's rotation and ensure driving contact with the bobbin by this yielding pressure. In a preferred form, the diameter of the circle of this clutch is much less than that of the circle of a regular whorl at the same point, allowing the bobbin to be thicker and stronger at the base. This is especially advantageous for filling bobbins, as it gives greater leeway for reaming, when reaming is necessary. The use of the centrifugal clutch will not only allow all the bobbins on all frames in a spinning room to be exactly at the same height, thereby gaining in length of traverse, but also lessen repairs or replacements of bobbins, for the bobbins used will be not only stronger, but subject to much less rough usage.



RABBETH CLUTCH.

THE MIRROR SPINNING RING.

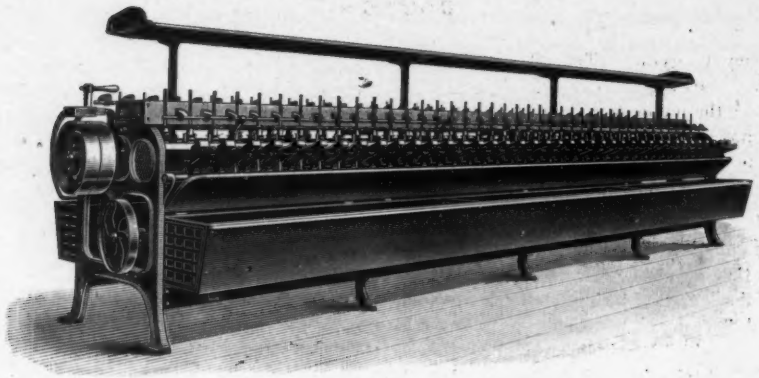
We illustrate herewith a spinning ring that is sold under the trade mark of "Mirror" registered with the United States Government and the State of Massachusetts. In the manufacture of this ring the polish is no longer governed by the personality of the man with the polishing stick nor by the possible carelessness of the inspector, but is done by machinery, the repeated contact of the polishing material being mechanically applied. The purpose of the manufacturer is to give a hard ring that will start the traveller easily.

MIRROR SPINNING RING.
The Draper Co., Hopedale, Mass.

SPOOLER.

The accompanying illustration shows a spooler that has some peculiar features of its own. In its construction the single rail is adopted for holding the spindle, which runs in a bolster with a closed bottom, and being held by the single rail, is always found to run freely, and the twisting or settling of the frame does not affect the spindle, as sometimes happens when two rails are used. The bolster case, between the spindle bearings at the extreme top and bottom, is enlarged to form a chamber holding a considerable quantity of oil. The spindle is further constructed so that all oil is thrown off before reaching the top of the bolster, and is then conducted back by channels to the oil chamber, thus avoiding waste. The spindle virtually runs in a bottle, and a little oil once in a month or two will be found sufficient, there being no waste except by evaporation.

To avoid cross banding at the end of the cylinder, two



SPOOLER.
The Whitin Machine Works, Whitinsville, Mass.

spindles are equipped with double whirls, driving from one to the other.

The bobbin boxes are of large capacity, and are fitted with shields to keep out dirt falling from above, or brackets are applied to receive the ordinary doffing boxes as they come from the spinning room. The wave or traverse is governed by a mangle, and on long machines is driven from both ends thus ensuring a very positive and steady motion to the guides the whole length of the frame, and guaranteeing perfect spools. The wave shaft is placed high in the frame, so that the levers operating the lifting-rods are well up from the mill floor. This prevents the breakage of the mangle by the levers striking any stray spools that may have fallen under the frame.

A NEW SPOOLER.

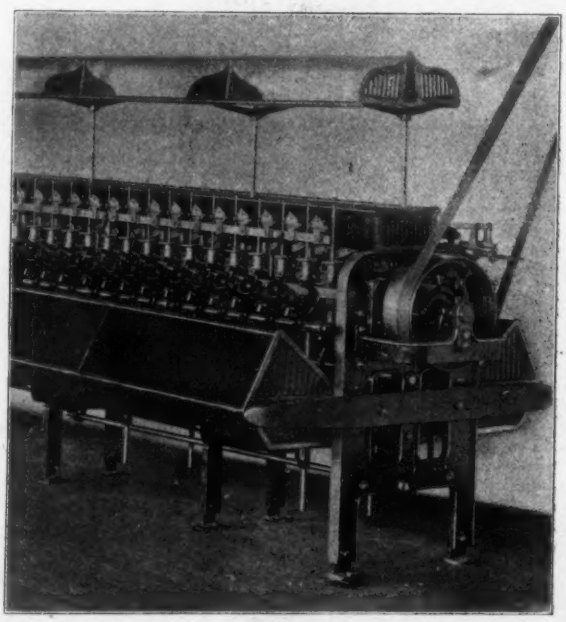
We illustrate with this a new spooler which has appeared on the market during the past year and which has met with decided success.

The process of spooling is to a considerable extent a hand operation which can be materially simplified by a machine designed to afford ease of operation and to overcome any inconvenience on the part of the operator which would impair his efficiency. The introduction of knot-tying hand machines has been of substantial benefit to the process of spooling, not only in increasing the capacity of the operator, but decreasing the expenditure of energy on his part, and has decidedly improved the quality of knots which have proven so objectionable in former methods.

The machine here illustrated is of metal construction throughout; the top creel, creel board box and side boxes, heretofore constructed of wood, are entirely of metal and substantially reinforced throughout. The top creel may be constructed for either one or two lines of spools placed at right angles to the principal axis of the machine, the length of spools over all being taken into consideration in determining the width of shelves.

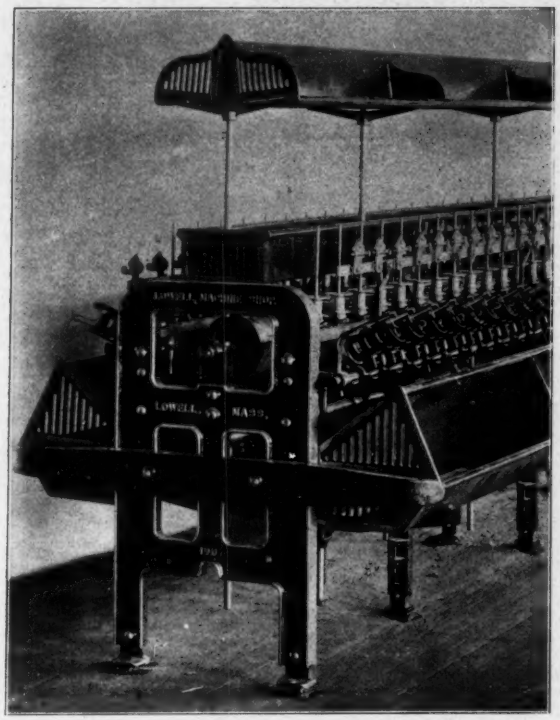
The side boxes may be of the side opening type, here shown, which is particularly adapted to spoolers of the traveling-belt bobbin-conveyor order, or may have side boxes opening at the top, and in such cases should be partitioned into small compartments to hold empty bobbins to avoid mixing empty and full bobbins. The side boxes merely rest in position on brackets provided and are readily removable in reaching the working parts behind the boxes. In place of side boxes, there are sometimes furnished shelves for boxes from the spinning room dispensing with the necessity of transferring the bobbins from the spinning room boxes to the side boxes forming a part of the spoolers. Doffing trucks in such cases are made with one of their boxes of the loose type. On this spooler is provided narrow canvas traveling belts on each side of the machine at the rear of the side boxes and under the bobbin holders, for conveying empty bobbins to a box at the end of and under the machine. The ends of side boxes are protected from trucks by heavy guards.

The spindles are of the single rail type, heavy in design and having 1¼-inch whirls. The usual spindle speed is from 750 to 900 r. p. m. The style of bobbin holder in a modification of the old Wade type wherein one of the wires is dispensed with. The bed of the holder is a part circle of large radius, making it unnecessary to adapt the bed to bobbins of different circumferences. Live side spindles are furnished for special purposes and usually the machine is equipped with at least two side spindles for winding off bad bobbins. These side spindles should be made to fit either spinning or twister bobbins as conditions suggest.



SPOOLER.
Lowell Machine Shop, Lowell, Mass.

Mills frequently fail to select proper sizes of spools. These should always be as large as the yarn and other conditions permit. They should be bushed with hardwood and when it is desired to reduce their weight should be ordered excavated and with soft wood barrels, due regard being paid to the proper diameter of the barrel. The modern form of metal or fiber heads show economy over the older forms, though more expensive in first cost.



SPOOLER.
Lowell Machine Shop, Lowell, Mass.

There are several forms of thread guides all of which are now made adjustable. The form shown on machine illustrated has its bottom member over which the yarn passes made of glass embedded securely in metal. This prevents its guide from wearing in ridges and affords a smooth surface for the yarn to pass over, at the same time allows accurate adjustment of the upper portion of the guide. The guides are mounted on a flat rod, avoiding the difficulty of turning on round rods, or otherwise getting out of position.

The drums are made of two thicknesses of heavy tin with broken joints and reinforced inside with corrugated discs. The drum bearings are of the latest ring oiling type and the main driving pulleys are provided with an outboard bearing, the loose pulley being placed on a sleeve or quill causing the loose pulley to remain stationary when the belt is on tight pulley.

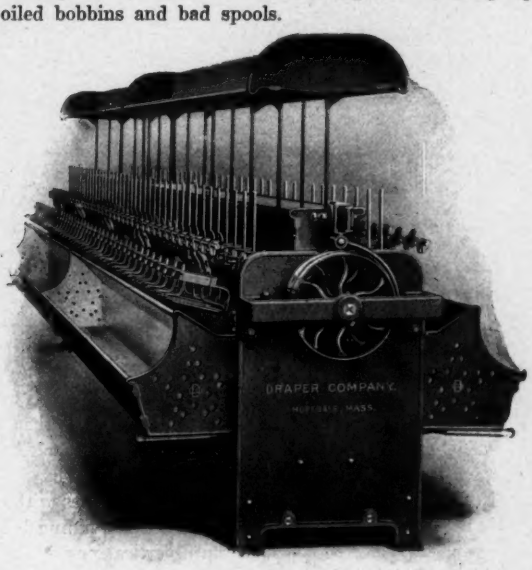
The ends and intermediate feet of the machine are adjustable, having jack screws for raising or lowering machine and for releveling. The traverse motion is of an improved mangle wheel type so arranged that a change of gear changes the length of the traverse. The speed of the traverse is similarly changed.

The process of spooling in a cotton mill is frequently given insufficient thought and a thorough investigation into the conditions in each case will often result in material benefit.

In this article we have alluded to the selection of proper sizes of spools, bobbin holders, design of side boxes and other essential features, and if mills, particularly new ones, will avail themselves of information attainable regarding modern practice in reference to spooling and apply the same to their particular conditions, the cost of spooling and subsequent processes can be materially reduced and benefited.

SPOOLER.

The accompanying illustration of a spooler is known in the trade as the "Draper I Model Spooler." This machine has self-discharging bobbin-holders with chutes or travelling belts. The chutes allow the bobbins to drop into receiving boxes resting on the floor, while the travelling belt collects the bobbins in boxes. At the end of the machine, there are two belts to keep the bobbins from each side of the machine separated, which is an advantage in checking up spoiled bobbins and bad spools.



MODEL 1 SPOOLER.
The Draper Co., Hopedale, Mass.

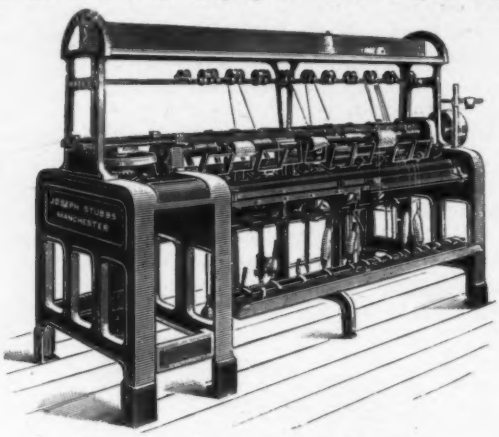
The creels and boxes are made of metal because they will not split, sliver, crack, smash or wear out. The frame is built with adjustable legs to accommodate different sizes of help, and spindles are of the latest single rail pattern with the Woodmancy retaining lock and oil cover. The holders are of a pattern which accommodates different sizes of bobbins, and allows for change in the wires for different numbers of yarn.

One of the most important improvements in this machine is the traverse motion designed to do away with the difficulties always attending the old-fashioned lifting rods. The new system uses rocking arms instead of sliding levers, doing away with the sticking common to any sliding bearing. The rocking motion keeps the guides moving on the arc of the circle, so that the yarn has a continual lengthwise motion in the guides, keeping them free from lint, saving the trouble of cleaning, lessening breakages, and making less knots to be tied. The guides are not worn in ridges.

The use of the new Rhoades bobbin holder enables the operator to tend more spindles.

TRAVERSE DOUBLE WINDER.

The illustration of the machine herewith described for winding two or more yarns or threads, either from mule cops, ring or double flanged bobbins, on to paper or wood tubes, making spools either parallel or conical in shape. It has strong iron framing with strong iron rail in center and one on each side carrying the cradles or spool holders.



QUICK TRAVERSE DOUBLE R WINDER.
Jos. Stubbs, Represented by Wm. Firth Co., Boston, Mass.

It has a shaft on each side carrying friction drums or pulleys, each drum driving one spool only, and a traverse motion, consisting of a combination of crank and cam arrangement. The cam is so shaped that the sharp "nose" is dispensed with, thus preventing the wear common in some other motions of this class. The yarn guides automatically thread themselves. The stop motion is made on the "detector wire" system, and is of simple construction, which breaks the contact between the spool and drum when any thread breaks. The parts are few, interchangeable, difficult to get out of order, and are all machined by special tools. There are polished sides and bobbin boxes with iron divisions. The creel for mule cops or ring spinning bobbin is arranged inside the cop boxes in a vertical position. For double-flanged bobbins the required number of stationary spindles are fixed in a polished wood board, and mounted on adjustable iron brackets in an inclined position. The usual gauge of drums is 7 inches to make spools 5 inches traverse up to 6½ inches diameter.

CONE WINDING.

The accompanying two illustrations show, first, a serious defect in cone winding, and, second, a method by which this defect can be remedied.

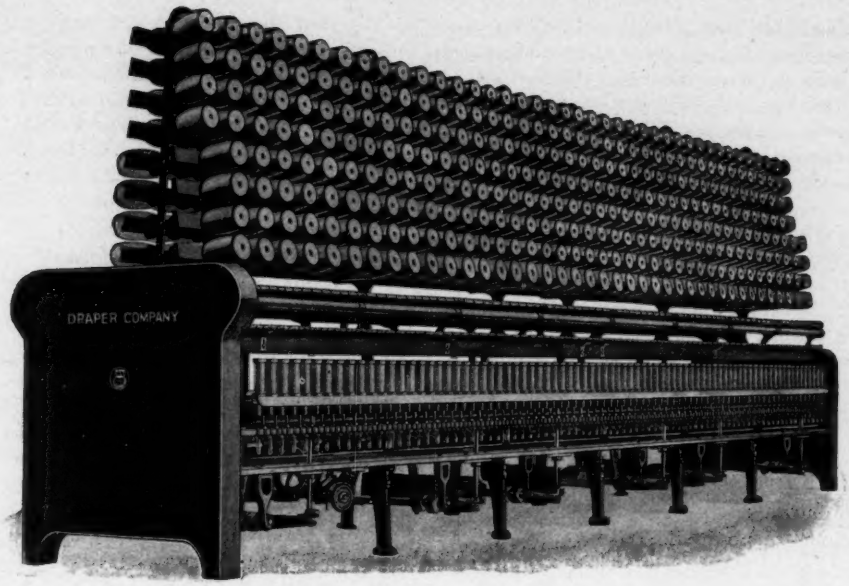
Figure 1, shows an ordinary cone of hosiery yarn wound open until a diameter is reached where the revolutions of the cone and strokes of the guide are at the ratio of eight, four or two to one. At these points the yarn coils wind on the same path instead of by being spread out over the cone surface. The parts of cone surface thus left uncovered are in contact with driving drums or spindle a sufficient length of time to become chafed, and in the case of very soft or slack twisted yarn, worn out, causing loose ends with attendant knitting troubles.

Figure 2, shows a cone wound on a winder which has a speed changing device or differential motion that alternately accelerates and retards the cone driving mechanism and prevents an even speed ratio between guide and cone. The result is a cone wound open from start to finish as shown without loose ends. This cone, it will be noted, has more of a tapr than was formerly produced which, in addition to the differential wind, makes it a finished knitting package.

FIG. 1.

FIG. 2. NO. 12 MODEL WOUND CONE.
Foster Machine Co., Westfield, Mass.

Inquiries about anything pertaining to the textile business will be cheerfully answered by COTTON.



TWISTER.
The Draper Co., Hopedale, Mass.

TWISTER.

The illustration of the twister shown herewith is of a heavy and substantial pattern which has met with the approval of manufacturers who have used it. The samsons have adjustable legs to accommodate any variation in the floor level. The twist gear is arranged directly on the end of the cylinder shaft by which arrangement the range is greater with less changes.

A traverse motion is fitted for change gears so that the speed can be accommodated to conditions to prevent the thread from winding under or piling on the bobbin. A simple lever clutch is used to throw the traverse motion out of gear, so that the ring rail may be lowered at any time when necessary.

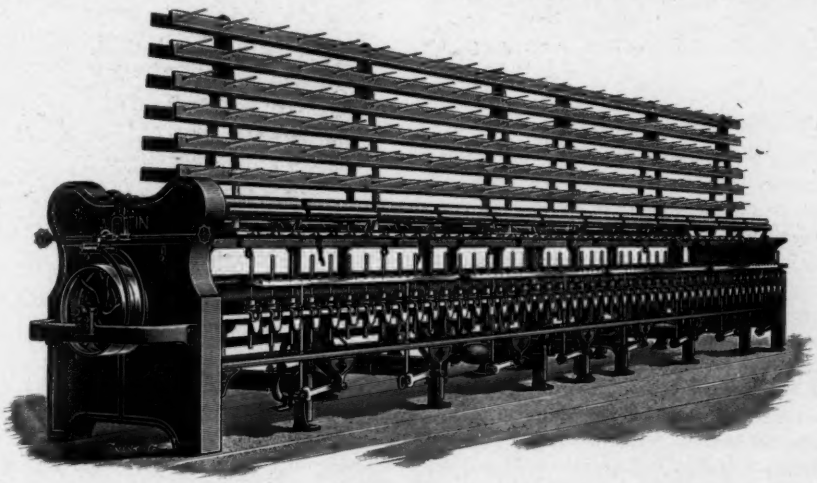
The Smith stop motion is recommended for two-ply work. Its use enables the help to tend more spindles, practically stops all roll waste and allows speed to be increased.

The latest improvement in these twisters is the substitution of metal for wood in the creel.

TWISTER.

The twister which we illustrate herewith resembles in its general construction a ring spinning frame. It is built with the box end enclosing gearing, outboard bearing for pulley arbor, and adjustable feet on sampsons and foot end. The twister is fitted with a patent dev'ce for locking the ring rails when doffing. The gearing may be arranged at the option of the purchaser to drive each side of the frame independently of the other, thereby producing two different twists at the same time, if desired. The twister is arranged to twist from spools only.

The delivering rolls, 1½ inches diameter, are built in two styles, viz.; two lines of lower rolls with heavy single



TWISTER.
The Whitin Machine Works, Whitinsville, Mass.

line of top rolls, generally used in heavy dry twisting; and single line of lower rolls with single line of top rolls, which are used in both dry and water twisting.

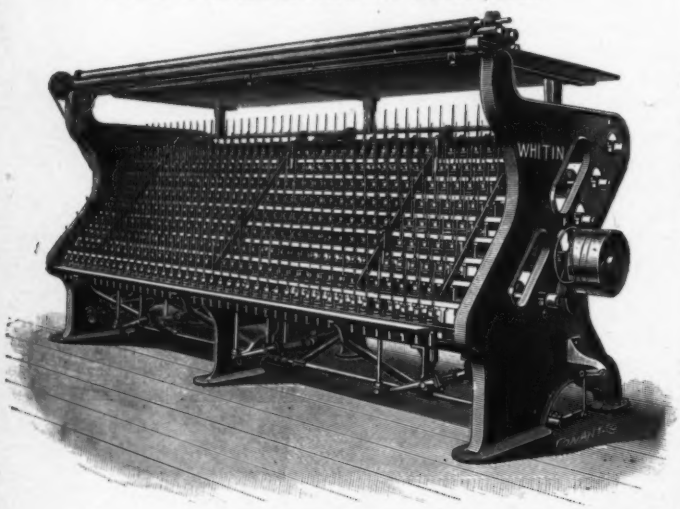
In water twisting the rolls are brass or brass covered and the yarn is held under water contained in a trough by glass rods or revolving brass rolls, which, by a simple device, can be raised to free the yarn from the water or for cleaning.

The machine is piped to connect the trough with the water and drain system of the mill so that a continuous circulation of clean water may be maintained, thus ensuring the cleanliness of the yarn while passing through the water.

A simple and effective knee brake is provided for each spindle by means of which any spindle may be stopped independently of the rest, while piecing up. The traverse is from 4 to 7 inches.

LONG CHAIN QUILLING MACHINE.

In preparing yarn for colored goods, the advantages gained by the chain system of dyeing, over the skein, are many both in the line of economy as well as in the quality of the yarn produced. It is evident that some good method whereby the yarn which has already been dyed or bleached in the chain could be directly put on to quills or bobbins ready for weaving, must present itself favorably to the attention of all manufacturers of colored goods.



LONG CHAIN QUILLING MACHINE.
The Whitin Machine Works, Whitinsville, Mass.

To accomplish this, the machine shown in the accompanying illustration has been constructed. The chain of the yarn, that comes to the machine from the dry cans or dry room, is placed on a turn-table and passed over friction drums, same as in ordinary chain beaming. The whole operation being similar to beaming.

The machine is very simple, and easily operated by girls. Any ordinary size quill or bobbin can be used; those generally used contain 1800 yards of No. 28 yarn, and 2,000 yards of No. 33 yarn.

The building motion on machine has a quick return which securely binds the yarn on the quill, thereby forming a very solid and compact bobbin. "Lapped ends" can not be made, consequently bobbins will weave from start to finish without break of yarn, and also without leaving any waste on bobbin.

The yarn does not come in contact with any friction, thus burnishing and burning or changing of color is prevented, colors being left bright and clear as originally dyed.

The shipper motion is operated by the foot of the operator, leaving both hands free. The machine is also provided with a "slow motion." Each machine has 378 spindles. The method of doffing is the same as on mules, the yarn being depressed below the bottom of the quill or bobbin and then wound on the bare spindle.

The makers claim the following as being among the many advantages gained by the use of this machine:

First. The putting of yarn on quills or bobbins direct from chain, or, in other words, from chain to quill or bobbin ready for weaving without any intermediate process.

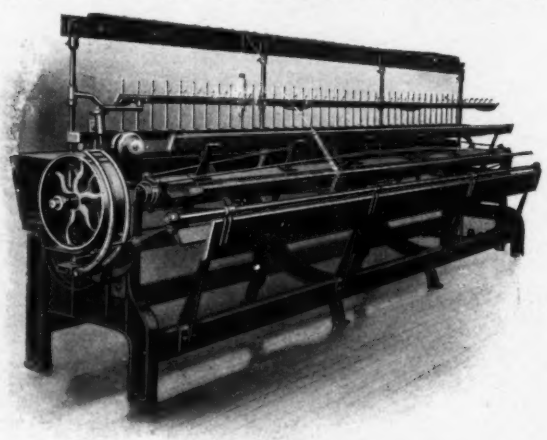
Second. The greatly increased amount of yarn put on to quill or bobbin, the avoidance of lapped ends, and the increased product per loom gained thereby; the avoidance of burn and burnished yarn, whereby the strength as well as the original brightness and clearness of the yarn is fully maintained.

Third. Goods look brighter and better. Second quality is largely reduced because of absence of mixed shades of color.

Fourth. A great saving in waste is effected, and a very material reduction in cost is made.

REEL.

We show herewith a reel whose traverse motion is geared and positive, winding a well-bound skein. The bearing on the driven end is set in a ball and socket joint, so that it can not be strained in lifting the swift for the removal of the yarn. The bearing on the opposite end is protected and prevents any oiling of skeins. The releasing arms and traverse are furnished with metal bearings, fitted in boxes. The swift is of hard wood, for lightness, and is very stiff. The bobbin box has waste boxes at each end,

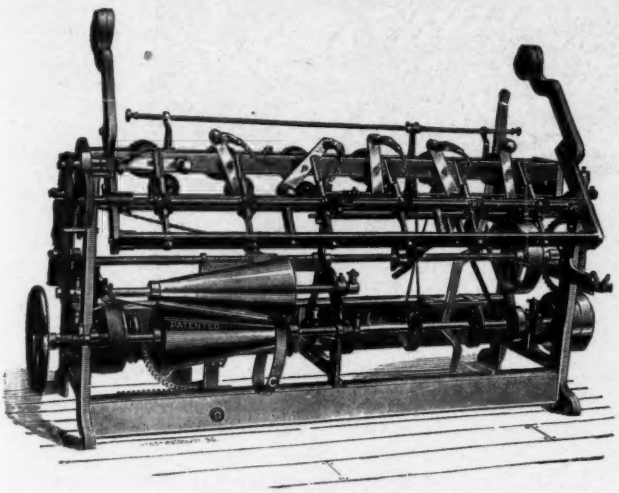


REEL.
The Draper Co., Hopedale, Mass.

and is protected from any drip from the spindles. These reels are fitted with front spindles for cops or for spinning or twisting bobbins, each spindle being removable independently of others. The spindle bearings have a hinged protecting board, preventing dirt and flyings from lodging. A gong is attached to strike at the completion of each hank of 840 yards, or when any other length desired has been reeled.

AUTOMATIC BALL WINDER.

In this connection we show two illustrations, one of an automatic ball winder and one of a few of the products made thereon. The machine is adapted to wind glazed twine, wrapping twine, cotton knitting yarn, knitting silk on spools or cores, thread, druggists' fancy twine, woolen yarns, wicking, hemp, jute, paper twine, and a great variety of other twines, yarns, cords, etc. Creels are made



AUTOMATIC BALL WINDER.
North Chelmsford Machine & Supply Co., North Chelmsford, Mass.

for bobbins, spools, skeins or cones. Spindles are made either plain, fluted or grooved, as may suit the fancy of the customer. The machine stops automatically when a set of balls is completed. The lay is controlled throughout the wind of the ball by a cone motion. The machine completes a set of balls at each revolution of the cam shaft, upon which are the cone cam with stop dog, and the tip, or builder, cam. The changing belt and gears between the cam shaft and the driving shaft determine the speed of the cam shaft, and, consequently, the number of revolutions of the flyer, or turns of twine on the ball, and its size and weight. Increasing the speed of the cam shaft diminishes the number of turns of twine on the ball, and its size and weight; increasing the speed of the ball spindles diminishes the closeness of the laying and vice versa. Changing the belt on the two step cones either doubles or halves the number of revolutions of the cam shaft. The change gears at the foot end of the machine determine the speed of the ball spindles and, thereby, the closeness of the laying. The cone cam, with its lever and connection, varies the speed of the ball spindles at different diameters of the balls. The tip, or builder, cam with its connection, governs the shape of the ball, and, with the same cam, shortening the connection lengthens the ball in the direction of its axis, and vice versa.

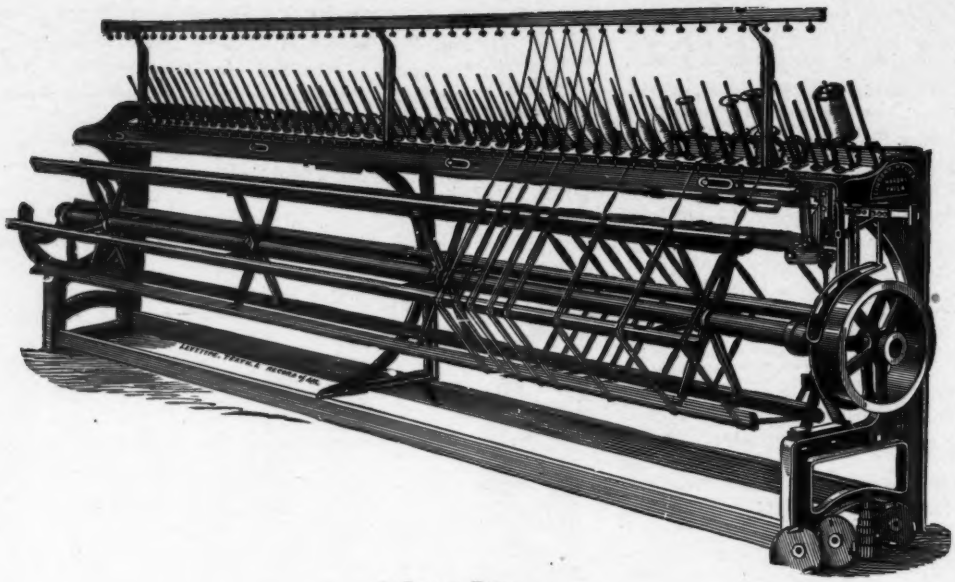
TWIST TABLE.

Counts or Numbers.	Square Root.	Frame Warp Twist.	Extra Mule Warp Twist.	Frame Filling Twist.	Mule Filling Twist.	Twist for Doubling.	Hosiery Yarn.
1	1.0000	4.75	4.00	3.50	3.25	2.75	2.50
2	1.4142	6.72	5.66	4.95	4.60	3.89	3.53
3	1.7320	8.23	6.93	6.06	5.63	4.76	4.33
4	2.0000	9.50	8.00	7.00	6.50	5.50	5.00
5	2.2360	10.62	8.94	7.83	7.27	6.15	5.59
6	2.4494	11.63	9.80	8.57	7.96	6.73	6.12
7	2.6457	12.56	10.58	9.26	8.60	7.27	6.61
8	2.8284	13.43	11.31	9.90	9.19	7.78	7.07
9	3.0000	14.25	12.00	10.50	9.75	8.25	7.50
10	3.1622	15.02	12.65	11.07	10.27	8.69	7.90
11	3.3166	15.75	13.26	11.61	10.78	9.12	8.29
12	3.4641	16.45	13.86	12.12	11.26	9.52	8.66
13	3.6055	17.12	14.42	12.62	11.72	9.91	9.01
14	3.7416	17.77	14.96	13.10	12.16	10.29	9.35
15	3.8729	18.39	15.49	13.56	12.59	10.65	9.68
16	4.0000	19.00	16.00	14.00	13.00	11.00	10.00
17	4.1231	19.58	16.49	14.43	13.40	11.34	10.31
18	4.2426	20.15	16.97	14.85	13.79	11.66	10.60
19	4.3588	20.70	17.43	15.26	14.17	11.98	10.89
20	4.4721	21.24	17.89	15.65	14.53	12.30	11.18
21	4.5825	21.76	18.33	16.04	14.89	12.60	11.46
22	4.6904	22.27	18.76	16.42	15.24	12.89	11.73
23	4.7958	22.78	19.80	16.79	15.59	13.19	11.99
24	4.8989	23.27	19.59	17.15	15.92	13.47	12.25
25	5.0000	23.75	20.00	17.50	16.25	13.75	12.50
26	5.0990	24.22	20.39	17.85	16.57	14.02	12.75
27	5.1961	24.68	20.78	18.19	16.89	14.29	12.99
28	5.2915	25.13	21.16	18.52	17.20	14.55	13.23
29	5.3851	25.58	21.54	18.85	17.50	14.81	13.46
30	5.4772	26.02	21.91	19.17	17.80	15.06	13.69
31	5.5677	26.44	22.27	19.49	18.10	15.31	13.92
32	5.6568	26.87	22.63	19.80	18.38	15.55	14.14
33	5.7445	27.28	22.98	20.11	18.67	15.80	14.36
34	5.8309	27.69	23.32	20.41	18.95	16.03	14.58
35	5.9160	28.10	23.66	20.71	19.23	16.27	14.79
36	6.0000	28.50	24.00	21.00	19.50	16.50	15.00
37	6.0827	28.89	24.33	21.29	19.77	16.72	15.21
38	6.1644	29.28	24.66	21.58	20.03	16.95	15.41
39	6.2449	29.66	24.98	21.86	20.30	17.17	15.61
40	6.3245	30.04	25.30	22.14	20.55	17.39	15.81
41	6.4031	30.42	25.61	22.41	20.81	17.61	16.01
42	6.4807	30.78	25.92	22.68	21.06	17.82	16.20
43	6.5574	31.14	26.23	22.95	21.31	18.03	16.39
44	6.6332	31.50	26.53	23.22	21.56	18.24	16.58
45	6.7082	31.86	26.83	23.48	21.80	18.45	16.77
46	6.7823	32.21	27.13	23.74	22.04	18.65	16.96
47	6.8556	32.56	27.42	23.99	22.28	18.85	17.14
48	6.9282	32.90	27.71	24.25	22.52	19.05	17.32
49	7.0000	33.25	28.00	24.50	22.75	19.25	17.50
50	7.0710	33.58	28.28	24.75	22.98	19.44	17.68

WHITIN MACHINE WORKS.

A great many growers hold to the opinion that seed is a more favorable fertilizer, because it has some lasting effect on the land, and that you can trace its effect for several years. This, is a decided disadvantage, because you have to wait two or three years to get the full benefit of the seed, whereas you get it in one year.

A FEW OF THE PRODUCTS OF AUTOMATIC BALL WINDER.



A SLACK REEL.
Lindsay, Hyde & Co., Philadelphia, Pa.

SLACK REEL.

The slack reel shown herewith is used in the making of upholstery yarns and carpet yarns of two, three or four-ply. The operation used is the same as a plain reel following up a mule or spinning frame and is desirable where it is necessary to put a slight twist in the yarn say, from one to ten turns to the foot in either two, three or four-ply. The number of turns to the foot is regulated by the size of the pulleys. The yarn is wound upon revolving flyers and the machine is built to make 50 skeins at a time, and the spindles are so located that the operator can see at any time when a thread breaks. It is in use now in a number of cotton mills in the South where it is desirable to have the yarn reeled in slack skeins.

SETTLEMENT OF THE LANCASHIRE COTTON WAGES DISPUTE.

Below we give the official account of the terms of settlement of the lockout of employees by the cotton mills of Lancashire, England:

Terms of agreement between the Federation of Master Cotton Spinners' Association, the Amalgamated Association of Operative Cotton Spinners, the Amalgamated Association of Card and Blowing Room Operatives, the Amalgamated Northern Counties Association of Warpers, Reelers and Winders on the question of a 5 per cent. reduction in wages.

It is hereby agreed that on and after the first pay day in March, 1909, the wages of the operatives in the departments covered by the above-mentioned operatives' organizations shall be reduced 5 per cent., such reduction to be under the terms and conditions of the Brooklands Agreement.

THE NATIONAL COTTON ASSOCIATION.

The joint committee appointed at the recent meetings of the Southern Cotton Association and the Farmers' Union at Memphis and New Orleans, has announced the organization of the National Cotton Association, with Harvie Jordan, of Atlanta, president, and Lee Richardson, of Vicksburg, treasurer.

Each cotton growing county in the South is to be organized, and all bankers, merchants and other business men as well as farmers, will be invited to join so that the brains and the money of the South may be united to one end, the betterment of the condition of cotton farmers and dealers. Prominent members of the Farmers' Union have agreed to join hands in the movement through their own organization.

To increase warehouse capacity, improve the financing and handling of the cotton crop and organize a bureau of statistics that will give reliable information on the condition of the crop at all times, are the objects of the new association.

PRODUCTION TABLE OF RING WARP YARN.

FRONT ROLL 1-INCH DIAMETER.

Number of Yarn.	Twist per Inch.	Rev. of Front Roll per Minute.	Rev. of Spindles per Minute.	Hanks per Day per Spindle.	Pounds per day per Spindle.	Number of Yarn.
4	9.50	166.0	4950	9.115	2.279	4
5	10.62	163.2	5450	8.962	1.792	5
6	11.63	161.4	5900	8.863	1.477	6
7	12.56	159.6	6300	8.764	1.252	7
8	13.43	157.6	6650	8.654	1.082	8
9	14.25	156.3	7000	8.583	.954	9
10	15.02	153.6	7250	8.530	.853	10
11	15.75	151.5	7500	8.413	.765	11
12	16.45	150.0	7750	8.330	.694	12
13	17.12	147.8	7950	8.208	.631	13
14	17.77	145.9	8150	8.103	.579	14
15	18.39	143.6	8300	7.975	.532	15
16	19.00	141.5	8450	7.858	.497	16
17	19.58	139.7	8600	7.758	.468	17
18	20.15	138.1	8750	7.670	.429	18
19	20.70	136.0	8850	7.553	.398	19
20	21.24	134.0	8950	7.525	.376	20
21	21.76	132.3	9050	7.430	.354	21
22	22.27	130.0	9100	7.301	.332	22
23	22.78	127.8	9150	7.177	.312	23
24	23.27	125.8	9200	7.065	.294	24
25	23.75	124.6	9300	6.998	.280	25
26	24.22	123.7	9400	7.024	.270	26
27	24.68	121.9	9450	6.922	.256	27
28	25.13	120.2	9500	6.825	.244	28
29	25.58	118.2	9500	6.712	.231	29
30	26.02	116.2	9500	6.598	.220	30
31	26.44	114.4	9500	6.496	.210	31
32	26.87	112.5	9500	6.388	.200	32
33	27.28	111.4	9550	6.326	.192	33
34	27.69	110.3	9000	6.263	.184	34
35	28.10	108.7	9600	6.240	.178	35

Allowance has been made for cleaning, oiling and doffing.

WHITIN MACHINE WORKS.

COTTON MANUFACTURING

PROCESSES IN COTTON MANUFACTURING.

THE COMBING PROCESS. THE DRAWING FRAME. SETTING OF THE DRAWING ROLLS. THE CLEARERS. HOW TO CALCULATE PRODUCTION.

BY CHARLES E. BARNHARDT.

PART IV.

In the manufacture of coarse and medium numbers of yarn the stock after coming from the card is next subjected to the action of the drawing frame. However, in making fine yarns, from about No. 60 and upwards, and when the product is required to be very uniform and of a high grade, the drawing frames are substituted by the combing machinery.

As very few mills in the South are equipped with combing machinery as compared with the number running drawing frames, only a brief description of this process will be given. The three machines as used in the combing process are as follows, the sliver lap machine which has for its object the formation of a number of the card slivers into a lap, the ribbon-lap machine which has for its object the combining of several of the laps from the sliver-lap machine into a more even and regular lap for the comber, and the comber which removes the short fibers and straightens out and arranges the remaining long fibers in a parallel order.

When combing machinery is used the stock is usually taken to the sliver-lap machine from the card, although in some instances it is passed through one process of drawing before being subjected to the action of the combing machinery. In the operation of the sliver-lap machine, from twelve to sixteen ends of sliver from the card or drawing frame, as the case may be, are fed into this machine from roving cams placed at the back of the machine. The ends of the sliver are passed over balanced spoons similar to those found in connection with the drawing frame for automatically stopping the machine when an end breaks or runs out. This machine is equipped with three sets of drawing rollers, the draft of the sliver-lap machine is usually about two. The stock on coming from the drawing rollers is passed between a pair of presser rolls and condensed into a small lap or sheet, from seven to ten inches in width. This sheet is in turn tightly wound on a wooden spool and when full will measure from ten to twelve inches in diameter. The machine is supplied with a full lap stop motion for automatically stopping it when the required number of yards of stock have been wound on the spool.

Six laps from the sliver-lap machine are placed on the creel of the ribbon-lap machine, this being arranged so that the laps will unroll one on top of another, and when presented to the drawing rollers, will be in the form of a single lap of six thicknesses. Thus it will be readily seen that any unevenness in any lap from the sliver-lap machine will be practically eliminated by these doublings. This machine is supplied with four sets of drawing rolls, the draft of this machine usually being six. The lap delivered from the ribbon-lap machine is about one inch wider than those fed into it, in order to allow for the spreading which takes place in its being drawn out, and is also wound on a wooden spool. This machine is supplied with stop motions similar to those of the sliver-lap machine for stopping it when a lap on the creel runs out, and when the lap being formed is of the required length.

The comber is built with six or eight heads or sections, each head being supplied with one of the laps from the ribbon-lap machine. The lap fed into the machine is passed through feed rollers the speed of which are intermittent, the stock thus presented is combed and acted on by the mechanism of the machine in such a manner that all the short fibers are removed and the ones of sufficient length are straightened out and arranged parallel to each other, the stock being delivered from the coiler of the comber in the form of sliver and deposited in a roving can.

The drawing frame is the last process through which the stock passes having for its principal object the making uniform of any uneven places in the sliver. In addition to this the action of its rollers are such that some of the remaining short fibers are collected on the clearers which cover the rolls and the long fibers are further straightened out and arranged side by side. Until a few years ago three processes of drawing frames were in general use, but the mills being equipped in these days are usually supplied with only two processes, and many mills which have been equipped with three processes have dispensed with the use of one process, since it has been found that almost equal results can be obtained if the machines are properly attended to, and saving is thus effected in the cost of machinery and in dispensing with the labor required to operate the third process. The machines used in the two or three processes are identical in construction and operation.

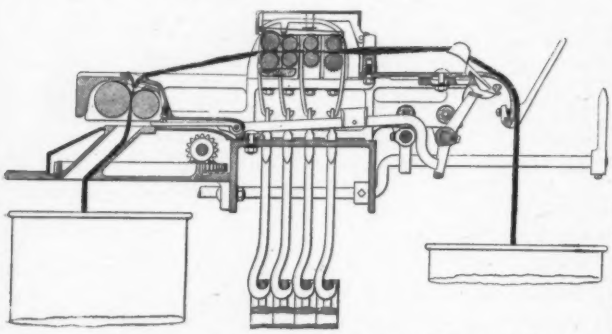
The full cans of sliver are set at the back of the drawing frame and usually six ends are run into one delivery, thus the machine has a doubling of six. A frame or "head" means a series of deliveries, from two to eight, the most usual number found being four, which are driven by one belt and governed by one set of roller gearing. For example, a frame or head of four deliveries doubling six ends, means that twenty-four ends of sliver are fed at the back of the machine, while four ends are produced at the front. Two or three heads are usually coupled together and driven from one main shaft, and in this case each frame or head is driven separately from a shaft underneath the beam of the frame.

Drawing frames are usually placed in the mill in a tandem position, that is one, two or three frames are placed one in front of the other, called a set, the delivery end of each process facing the same direction, with the back of the first process next to the line of cards. Thus the cans of sliver are brought down the alley between the cards and placed at the back of the first process of drawing, and the cans from the first process by being moved backwards a little distance are in position for feeding into the second process, etc. By this arrangement the frames are easiest attended to and take up the least amount of floor space.

In a small mill where floor space is limited all the frames are sometimes placed in a single line or row. In this arrangement the first process is arranged so that its back is convenient to the cards, the second process is placed in line with the first with its back on the same side as the

front of the first process, and if the third process is used, it is placed in the same position as the first. Thus it will be seen that the cans of sliver delivered from the first process by being moved down the line a few feet will be in position at the back of the second process, and prevent the necessity of carrying the cans around to the other side of the line of drawings, which would be the case if the fronts of the frames for the different processes faced in the same direction.

The action of the drawing frame is the simplest of any machine in use in connection with cotton spinning, the only effect that it has upon the stock is that of doubling and drawing. The draft being applied by means of four sets of rollers, each set running at a higher speed than the preceding one. The end of the sliver being fed into the machine is first passed over the feed stop-motion, or "spoon," as it is commonly called. The upper part of the spoon is hollowed out in order that it will retain the sliver passed through it, while the lower end is made in the shape of a hook. This spoon is balanced on a knife edge in such a manner that the lower part is a little heavier than the upper and the sliver in passing over it depresses the upper part. However, when the sliver breaks, or runs out, the lower or hooked end of the spoon drops down and comes in contact with a rocker arm and by arresting the motion of this arm the machine is stopped.



DRAWING FRAME. SECTIONAL ELEVATION. METALLIC ROLLS.

The evenness of the work produced on the drawing frame depends very largely on the care and condition of this stop motion. Very often it is not adjusted as it should be and the frame will run for some little time after an end breaks or runs out and consequently, a light place in the sliver is produced. When an end of sliver breaks or runs out care should be taken that the end by which it is replaced is started into the machine at exactly the point where they will meet, for if they overlap each other or if there is an interval between the ends, it will result in a light or heavy place in the stock delivered from the machine. The bottom rolls are fluted and made in sections, the different sections being joined together so that they will extend the whole length of the frame. The top is made in lengths for each delivery and rest in open bearings on the bottom rolls. The top rolls are either leather covered or made of steel, fluted similar to the bottom rolls. The fluted steel, or metallic rolls as they are called, are now used in almost all cases in preference to the leather covered rolls, on account of the less trouble and higher speed (consequently the greater production) at which they can be run. The metallic rolls do not require as heavy weighting as the leather covered rolls. A weight of about fourteen pounds being used for the metallic, while about eighteen to twenty pounds are used for the leather covered.

The distance apart that the rolls should be set depends on the length of the staple of the cotton being worked, the speed of the rolls and the weight of the sliver being run. The front and second set of rolls are set closest together, the distance between the bite of these rolls should be from one-eighth to one-sixteenth of an inch greater than the length of the fibers of cotton being used. The distance between the second and third rolls should be about one-eighth of an inch greater than that of the first and second, while that of the third and fourth should be from one-quarter to three-eighths of an inch further apart than the first and second. If the rolls are set too close together the fibers will be caught by the bite of the one set before it is released by the other and thus break the fibers. On the other hand the settings should not be too far apart, as one of the great objects of the drawing frame is to take the curl out of the fibers, and if set very much further apart than the length of the staple the proper stretching will not take place. The back rolls are set further apart than the front for the fact that the stock is heavier here, since most of the draft takes place between the front rolls. When light sliver is being made, or comparatively slow speed is run, the settings can be closer than when heavy sliver and high-speed is run.

The flutes of the metallic rolls should be cleaned at intervals of every few weeks, as they become clogged with dirt and lint, and if allowed to run in this condition the stock will be inclined to wrap around the rolls, and in addition to this there is danger of the fibers being cut. The best way to clean them is to sprinkle a little whiting over the rolls and rub them well lengthways with a piece of card clothing. The teeth of the card clothing will remove all the dirt from the flutes, while the whiting will polish the surface and remove any rust that may be present.

The object of the clearers is to keep the rolls clean, as the short fibers have a tendency to fly out from between the rolls, and if it were not for the clearers a great many would wrap around the rolls and cause considerable trouble. The clearers should be kept well covered with flannel, and picked every few hours while the machine is in operation so that a too large amount of waste is not allowed to accumulate on them.

The sliver on coming from the front roll is passed over a highly polished steel plate and drawn through the trumpet by which it is condensed, and placed in a roving can in the same manner as at the card. The trumpet is balanced in such a manner that while the sliver is properly passed through it, the front portion of it is held down. However, should it become clogged up or the sliver break, the back end, being a little the heavier will drop down and come in contact with an oscilating arm and stop the machine in the same manner as the stop-motion at the feed of the machine.

A stop-motion is also applied for automatically stopping the machine when the cans are full. When the cans are full, the pressure of the stock will raise the coiler gear a small distance which in turn operates on a rod in connection with the stop-motion lever thus stopping the machine.

The draft on the drawing frame is usually about the same as the number of doublings. Thus, if six ends are run together the draft on the machine should not be more than six. The draft gear on the drawing frame is rarely ever changed on account of the variation in weight of the sliver. However, the sliver should be weighed once or twice

a day, and if there is much variation from the correct weight the cause should be ascertained and corrected, else the number of yarn spun will be very uneven. These variations are usually caused by the card sliver being uneven, the stop-motions not being properly adjusted, thus allowing singlings to pass through, or the top rolls not correctly weighted.

The only calculations necessary in connection with the drawing frame are in reference to draft and production. In calculating the draft, consider that the back roll is the driver and the front calender roll the delivery. Multiply together all the driven gears and the diameter of the delivery roll, and divide the product thus obtained by that of the driving gears and the diameter of the feed roll.

To calculate the production, multiply the number of revolutions per minute that the calender roll makes by its circumference and by the number of minutes run in a day, and this product by the weight in grains of one yard of sliver. Divide the product thus obtained by 7,000 multiplied by 36. This will give the production in pounds for a day if the machine were run continuously. However, on account of the frequent stoppage from twelve to twenty per cent. must be deducted from the amount thus obtained in order to get the actual production.

When leather covered rolls are used the weights should be relieved from them if the machine stands idle for twenty-four hours or longer, for if this is not done the flutes of the bottom rolls will make impressions on the surface of the top rolls causing the fibers to tend to stick to them and wrap around them. The bearings of the top and bottom rolls and all the other quickly moving parts should be oiled twice a day, care being taken that none of the oil is allowed to get on the surface of the rolls. The power required to drive drawing frames is about one-horsepower to eight deliveries.

The weight of a lap is always expressed in so many ounces per yard, while the weight of the sliver from the card or drawing frame is expressed in so many grains per yard. The usual way of ascertaining the weight of sliver is to measure off a convenient number of yards weighed. This will give the average weight more accurately than if a single yard is weighed.

The stock from the drawing frame is next run through the slubber, and it is here that it receives its first twist and is put in a shape resembling yarn. From this process on, the weight of the stock is reckoned in the same manner as yarn, which is so many hanks to one pound. The hank is taken as the basis for numbering cotton yarn and roving, and is always 840 yards.

To find the hank of any roving, or the hank roving as it is usually called, divide the number of yards required to weigh one pound by 840, and the result will be the hank roving. Thus if there are 1680 yards in a pound it is two-hank roving, or if there are 420 yards in one pound it is one-half-hank, or five-hank roving as it is usually expressed. On account of the inconvenience in weighing and measuring a whole pound of roving, a certain number of yards are weighed and the hank roving calculated from this result. The most convenient number of yards to weigh is twelve, and a rule for finding the hank roving from the weight of twelve yards is as follows: Divide 100 by the weight in grains of 12 yards and the result will be the hank roving. The explanation of this rule is as follows: There are 7,000 grains in one pound, and 846 yards in one hank. Instead of taking the whole of these two quantities, the one-seventieth part of each are dealt with, which will give 7000÷70=100, and 840÷70=12. Thus it can be plainly seen that the result from these proportionate parts is the same as if the number of grains in one pound and the number of yards in one hank were dealt with.

WOOL MANUFACTURING.

FINISHING OF COTTON-WARP WOOLENS.

FULLING. RUNNING THE GOODS IN THE MILL. SOAPING AND COOLING. SPECK DYE. WASHING.

BY JOHN T. TIMMERMANN.

Part II.

It is a well recognized principle in fulling that the process will be hastened by crowding the goods under the rolls, and for this reason the pieces should be doubled or trebled in order to increase the volume under them. The capacity of the mill with regard to the number of pieces it will accommodate is usually such that two pieces on a side will fill the same as full as it is desirable or advisable to have it, and therefore in order to make the volume of cloth under the rolls greater than this, the pieces will have to be doubled or trebled and thus increase the volume under them without going beyond the capacity of the machine.

In such cases, the bulk of the goods or rather the weight of them as they come from the loom plays a very important part. We have run two pieces of satinet on a side of a mill which weighed 20 ounces per yard from the loom which for ¾ goods is certainly quite a respectable weight, but in order to bring the goods out right it was necessary to run them through the rolls in four thicknesses. When properly understood, this, of course, is quite a simple matter and in order to do it successfully the pieces should be sewn together making one continuous piece in place of two. The yards of the two pieces are then added together and this is divided by four. The resultant number of yards is then measured off on the first piece and a string tied around the piece at this point. The piece is then run into the mill until the string comes up. The mill is now stopped and the first end is taken from the bottom of the mill and tied securely to the piece at the point where the string has been placed.

Now the machine is started again and the pieces are run in to the end, and after showing the first and the last ends together, completing the endless string, it will be found that now the goods pass through the rolls four times. In this manner it is comparatively easy to have the goods pass through the rolls as often as the case may require, for all that is necessary is to find the total yardage of the goods to be run on a side and divide this by the number of times it is desired to run the goods through the rolls. For instance, it is required to run light weight

goods, and in order to give them the proper felt they should go through the rolls six times, and each side of the machine will readily accommodate three pieces.

It is necessary to find the combined yardage of the three pieces to be run, which we will say is 126 yards, and this divided by six gives us 21 yards. When the pieces have been sewn together, 21 yards are measured off on the first piece and the string tied here, and the pieces run into the mill in the manner stated, and after they are sewn together it will be found that they pass through the rolls six times. This is not merely a supposed case, but has been met in actual practice. The whole secret is simply in correct measuring, for if this is performed haphazard there is sure to be trouble.

The question of soap will now have to be considered, and in this instance the color question must also be taken into account. In order to achieve the results aimed at in the most expeditious as well as the cheapest manner, it is necessary that the fulling and coloring be done at the same time and this is done by embodying the coloring matter in the soap. That the cotton may be properly colored without affecting the fancy wool threads to any appreciable extent, requires the use of what is usually known as speck dye. To make a soap which contains this dye is not a difficult matter so long as the action of the several ingredients, one upon the other, is properly taken into account. To make a good speck dye requires extract of logwood, preferably liquid, as the basis for coloring, with blue vitrol and soda ash. The action upon each other of these last two is such that unless it is carefully watched quite an amount of waste is sure to result. As soon as these two ingredients are combined or rather come in contact with one another violent fermentation at once takes place which in many instances is so pronounced as to make it nearly impossible to confine them to where they belong. Of course, when the tank runs over the coloring matter is also wasted which has a tendency to make the dye of inferior quality. Many things have been tried to overcome this. Of course speck dye may be made by dumping all the required ingredients into the tank at once, and then proceed to boil them together; but the result is sure to be an inferior dye, and not alone that, it will also be a decidedly unreliable dye.

The same is the case if the logwood and soda ash are first combined and the vitrol added last, under the impression that the fermentation will not be so violent.

No matter what the different notions and theories about making speck dye may be, there is only one method which can at all times be depended upon to give a clear and reliable dye in every respect. This method is to combine first the logwood and vitrol thoroughly by boiling, then allow this to cool to about 80° F., then add the soda ash very carefully, a very little at a time, until all has been combined. If fermentation should occur so as to make the mass rise to any extent, stop adding the soda ash until it has quieted down. When all the soda ash has thus been added allow the mixture to lie dormant for about an hour when steam may be turned on carefully until the whole comes to a boil. Once it boils without rising the danger is over and steam may be turned on in full and the whole boiled thoroughly for at least four hours.

To make the matter plainer we will now give a specific receipt and show the manner of making the dye and soap. First it is necessary to find the capacity of the tank or other vessel wherein the speck dye and soap is to be made in order to find the exact amount of the several ingredients to be used. Let us suppose this to be a barrel holding, say 50 gallons. Then for this get ready 12½ pounds of good palm oil soap cut into small pieces, and put this into the barrel with about 10 gallons of water; also put in 30 pounds of liquid extract of logwood or hemlock of a low grade (the cheaper the better for this purpose), and add to this 8 pounds of blue vitrol. Now turn on the steam and bring this to a boil. Stir once in a while to see if the vitrol is all dissolved, and after that boil for 1½ hours. This will thoroughly combine the logwood and vitrol and will soften the soap enough so that it will readily dissolve when the soda ash is added. After boiling 1½ hours turn off the steam and allow it to cool down for an hour or so, and then add 45 pounds of soda ash by taking a small quantity at a time and sliding it down gently on the side of the barrel until all has been added. Now allow this to lie quiet another hour when the steam may be turned on slowly. Watch closely for fermentation which will show itself by a rise of the mass, and if not looked after and checked by turning off of the steam, and sometimes by adding cold water, it will soon run over the top. As soon as there is no more sign of the stuff rising, turn on the steam full force, and boil good for four hours. Allow this to become perfectly cold before using, for there is more harm done by using warm soap than by any other cause, and especially in this case where the soap is at the same time a speck dye. This will give a good bodied black soap, a trifle heavier than is actually required for fulling purpose, and of a coloring capacity to fully answer the purpose.

It may seem a waste to have the soap heavier than is actually required, but the final results will more than justify the seeming waste for the action and influence of a good bodied soap for fulling should be well enough known to need no further explanation, and beside this there will be no more soap required for the washing.

When the goods have been put in the mill and the ends properly sewn together it is a good plan to let them run for about five minutes before putting on the soap, to see if they run as they ought, for it is much easier and pleasanter to straighten out a snarl while the goods are dry than it is after they are wet with the black soap.

The amount of soap to be given the goods depends entirely upon the weight and length of the goods, and is a matter which the average mill hand should be able to attend to. But do not let the whole amount of soap be given at once; rather give the goods half the required amount, and after running about ten minutes give them the rest.

As stated before, the felting capacity of the stock, and of course the shrinkage, are such that very little care, aside from the goods properly in soap, is required. It will require about 2½ hours to produce any kind of felt, and in this time the width will not have suffered. About fifteen minutes before taking the goods from the mill add a dipper full of fresh soap to each piece, and when the 2½ hours are up they should be taken out and at once run into the washer. Here add some warm water and let them run fifteen minutes, then draw this mess off and give another supply of warm water and let them run twenty minutes, when the gates should be opened and the cold

water turned on for 45 minutes, when they may be taken out and will then be found clean and bright.

The old fashioned way of extracting is giving place to the use of squeeze rolls which leaves the goods in a much better shape for drying; but whatever method is employed it is of importance that the goods be got to the dryer as quickly as possible.

Another thing should be observed, and that is to arrange the washing so that the goods will not have to lie around before being washed. If this is ever necessary, the goods should be well opened and straightened, and folded smoothly in piles, and even then there is danger of their being cloudy and blotchy when finished. This is a point that will have to be specially looked after for upon it depends much of the success of the finisher's labors. Just so at night it is necessary that the pieces coming from the mill be at least run into the washer and given a run or two in cold water, if nothing more, and also see to it that no half finished set is left in the mills over night. These things require close attention, and this is one of the points which oftentimes taxes a finisher's ingenuity. After the goods are dried the after process is of little importance as it simply consists in a run or two over the shear and the subsequent pressing inspecting and measuring.

When treated in this way quite a respectable piece of cloth may be produced, but oftentimes it is found that though clean the stock is so low that the goods will crock some. This may be overcome by giving each piece a pailful or two of a heavy brine, made by dissolving a quantity of salt in a barrel of water. When ready to be taken from the washer shut the gates and give the goods this brine and let them run for two or three minutes, then take them out with this brine in them and proceed as before. This will effectually stop crocking.

KNITTING

TARIFF ON KNIT GOODS.

FULL-FASHIONED AND SEAMLESS HOSIERY IMPORTS. GERMAN ENTERPRISE. A TERRIFIC BLOW TO THE SEAMLESS HOSIERY BUSINESS. JAPAN BECOMING A COMPETITOR. PROTECTION IS NEEDED AGAINST JAPANESE INGENUITY AND CHEAP LABOR.

BY W. L. WARING.

Chairman Tariff Committee of the National Association of Hosiery and Underwear Association.

When the tariff bill, popularly known as the McKinley Tariff Bill, went into effect, it contained a clause reading "that on all hose and half-hose, whether full-fashioned or seamless, etc., valued at not more than 60 cents per dozen pairs, shall pay a rate of duty of 20 per cent. ad valorem and 20 cents per dozen specific duty." Within four months after the McKinley tariff bill became a law the Germans were selling freely and openly to this country the following merchandise, which was entered under the rate of duty mentioned above:

Men's Hermsdorf dye, full-fashioned sock, made of 18 single-carded yarn with high-spliced heel and double sole, weighing nineteen to twenty ounces at 60 cents net per dozen f. o. b. Chemnitz. With the rate of duty 20 per cent. ad valorem and 20 cents specific duty, it cost $1.00 per dozen net to land these goods in this country, and this merchandise was for years freely sold to the jobbers at $1.15 net.

This was a terriffic blow to the seamless hosiery business at that time and a long and loud complaint went up from the seamless hosiery craft, charging importers with undervaluation and other serious offenses, all of which they could not substantiate, and the goods continued to be sold.

At the same time, during the McKinley tariff period, not only was the above-mentioned sock brought into this country, but a ladies' full-fashioned hose, made of 19 single-carded yarn, weighing a pound ten ounces, was imported in enormous quantities. At first they were sold in the gray only and were dyed and finished here, but later they were imported in fast black, one-dozen boxes, and cost in this condition $1.00 net to land were freely sold in the open market by jobbers at prices varying from $1.15 net to $1.20 net, making a retail article of 12½ cents.

Now, the Germans are adepts in the making of hosiery; it has been an industry in Saxony for somewhat over a century and there is not a trick or a turn they are unable to avail themselves of when it comes to making merchandise to meet the United States tariff rates.

It is interesting to note that in July and August, just prior to the passage of the McKinley tariff bill, the sock which I have mentioned above as an example, cost in Chemnitz 4.50m. and the ladies' hose 5.50 m., less 4 per cent., which made the landed price under the old Morrell tariff of 50 per cent. ad valorem (cases, packing charges, etc., free), $1.60 and $1.98 regular, respectively.

Now, the McKinley tariff bill on the hosiery schedule was *avowedly* written in the interest of the domestic hosiery manufacturers and the rates on hosiery were the rates asked for by the domestic hosiery manufacturers, who at that time were making either seamless hosiery or cut-and-covered goods, and instead of giving them a protection as anticipated, through German manipulation of the cost of manufacturing, they were confronted with a condition vastly worse than under the old tariff of 50 per cent. ad valorem.

Our late honored and revered President McKinley made a true remark "that the manufacturer paid the tax." Well, the Chemnitz manufacturer certainly did in this instance. He manipulated his product so that he made a market in this country for his goods, but he did not make the profit he enjoyed under the old 50 per cent .duty; he paid the tax, but he did the business just the same.

Under the McKinley tariff rates German hosiery was materially cheaper than it had ever been before. A ladies' two-thread 38 combed Egyptian, Hermsdorf dye, full-fashioned hose with high-spliced heel and double sole, weighing two pounds, was freely imported so it could be landed at about $1.80 regular. Notwithstanding the apparent increase of duty the rates were made at such favorable points for the Germans that they were able to make such changes in their costs of manufacture to offset completely all efforts on the part of congress to give American manufacturers ample protection.

In further bearing out of the late President McKinley's remark "that the manufacturer pays the tax," it is interesting to note that under the Wilson tariff of 50 per cent. ad valorem on hosiery, which succeeded the McKinley

tariff, the Chemnitz manufacturers advanced their prices. The carded yarn half-hose and the ladies' carded yarn hose, which were imported under the McKinley tariff at 2.60m., less 4 per cent., $1.00 net landed, then advanced to 3m., less 4 per cent., and under the 50 per cent. duty, they then cost $1.02 net to land, and the result was that while the goods cost practically the same to bring into this country under the Wilson tariff as under the McKinley tariff, the Germans were getting forty pfennige, or $.0952 more for the goods than they did under the McKinley tariff.

There are very few hosiery manufacturers in this country who have any conception of the number of seamless machines that have been erected in Chemnitz to supply their own home-market trade. This is a growing industry in Germany. Up to the present time they have not attempted to export any seamless hosiery, but the day is not far distant when they will not only be supplying their own home market but will be knocking at the doors of the United States custom house to enter seamless hosiery into this country.

I am sure there are very few hosiery manufacturers in this country who know that Japan is rapidly putting up seamless machines. I have before me at the present moment a Japanese product made on a seamless machine which is decidedly interesting—a product, should it ever come in competition with our American manufacturers, will close every seamless hosiery mill in this country, unless ample protection is secured.

What I particularly want to impress on seamless hosiery manufacturers is this: That up to the present time we have been thinking solely of German competition, but there is rising in the East a competitor who is more dangerous and decidedly more aggressive in his business methods than the German has ever thought of being. This Japanese seamless hose that I have before me is made on a machine which is built in Japan and its mechanism is superior to any seamless hosiery machine existent in America at the present time.

Let the seamless hosiery manufacturers who think they are so snugly entrenched cogitate for a moment on Japanese competition. The wages paid a skilled German workman per diem would satisfy a Jap for a week—in fact, he would be glad, more than glad, to get that same amount of recompense for a week's work. All these matters must be taken into consideration when we think of tariff revision, because the next tariff will probably be in existence for at least seven or eight years. In the meantime none of us can predict what the Germans or Japanese will do in seamless hosiery. I admit the industry in Japan to-day is in its infancy, but who would have thought ten years ago that Japan could put in the field the finest trained army the world has ever known and would have conquered the colossus of Europe—Russia?

It is to the interest of every man connected with the hosiery industry in this country, whether he makes seamless hosiery or full-fashioned hosiery, to support the National Association of Hosiery and Underwear Manufacturers and their tariff committee in their efforts to protect the hosiery craft from unfavorable and unjust legislation.

The entire hosiery craft must be united and make a determined effort at the next session of congress to show the ways and means committee the need of protection and the amount of protection that it is necessary to have in order to maintain this large, growing and important enterprise in this country. The only way the hosiery industry can get any attention at all is by being united and working closely together and through one organization. The great trouble has been in the past, both under the McKinley tariff and the Dingley tariff, there has been no united stand or any preliminary thought or intelligent data on this subject, and the result has been that manufacturers went to Washington and laid before the committee their individual ideas—no two agreed, and valuable and important data was not submitted to the ways and means committee to substantiate the claims of the hosiery manufacturers.

In the past ten years there has been a vast change in the cost of living in this country. Labor has demanded and received large increases in wages—in fact, every item in the cost of manufacturing has increased, whereas in Germany the cost of manufacturing hosiery is practically the same as it was when the Dingley tariff went into effect, consequently what was acceptable protection ten years ago is not sufficient to-day.

FOR UNRAVELING THE END OF A KNITTED FABRIC.

The object of the device here shown is to provide means for unraveling the end of a knitted fabric to the looped point, dispensing with the unraveling of the thread by hand, and also dispensing with the cutters used in removing the waste courses.

Figure 1. is a perspective view illustrating the device applied to a looping machine. the looping machine, with the exception of its shaft, being shown in dotted lines; and Fig. 2 is a longitudinal sectional view of the attachment.

This attachment can be readily applied to any looping machine and will save the time of the operator in unraveling the waste ends of the fabric placed upon the points of the looper.

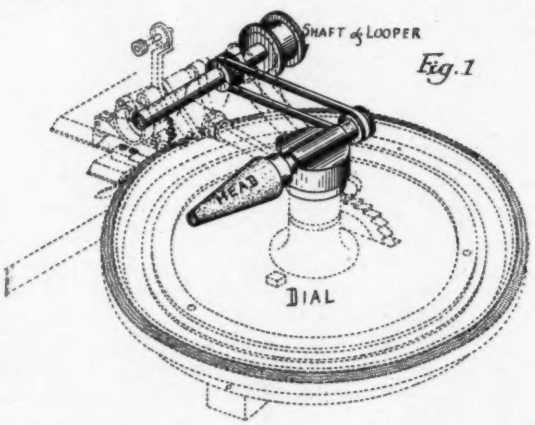
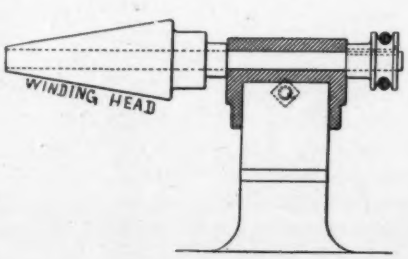


Fig. 1.

Fig. 2.

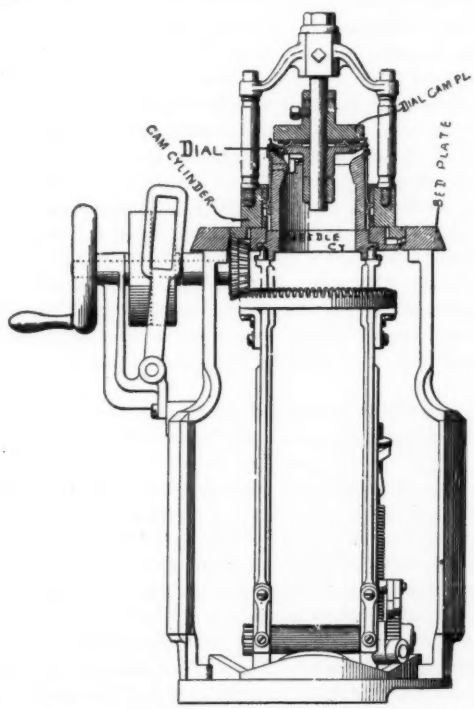


Heretofore loopers have been provided with attachments for cutting off waste courses from the end of the stocking or other fabric after it has been looped, but this leaves a rough edge at the loop where the ends are brought together, as in the toe of a stocking, and is objectionable for this reason, consequently in the better grade of stockings the operator unravels two or three courses until the loop is reached, this is the preferred method as it makes a much better finish at the end of the fabric, but operators object to the hand unraveling process as it is very tedious.

In using this attachment the end of the waste course is placed upon the revolving conical winding head and as the head revolves the thread is caught up and wound upon it; the surface of the head may be rough or smooth for the purpose. As the thread is wound upon the head it will unravel to the looping point, where it is severed. The driving band or belt, which drives the shaft carrying the head, will slip when any severe tension is placed upon the thread, so that it is impossible to draw the thread past the looped course. The fabric being held at the periphery of the dial by the quills in the usual manner.

TO INCREASE THE PRODUCTION OF A KNITTING MACHINE.

The object of the mechanism here shown is to obtain an increased production from a circular knitting machine by increasing the relative speed of rotation of the operative parts.



In ordinary circular knitting machines, as heretofore constructed, it has been supposed that the speed at which the machine may be operated is chiefly dependent upon overcoming the friction between the cam cylinder and the needle cylinder. It has accordingly been customary to rotate but one of these elements, and it has been deemed immaterial which one is rotated, so far as the question of speed is concerned.

In certain types of knitting machines the needle cylinder is maintained in fixed position, while the cam cylinder is rotated around it. In other types of machines, the cam cylinder is held stationary, while the needle cylinder is caused to rotate relatively thereto.

It has been discovered that apart from the frictional resistance between the two cylinders, there are additional factors which limit the speed of these machines. Among these factors are the friction occasioned by the motion of the gears and their driving members, and the centrifugal effect upon the yarn as it passes from the bobbins to the guide, whereby increased tension upon the yarn is created. In view of these factors it has been found that a greatly increased practical speed of operation can be obtained by driving both of the rotable members of the machine simultaneously in opposite directions. In this way, the out-put has been greatly increased per day.

When the main shaft rotates, the needle cylinder and dial are positively driven in one direction, while the cam cylinder and dial cam plate are positively driven in the opposite direction. A relatively rapid motion is thus secured between the needle cams and the needles—more rapid than has even been practical in any of the standard types of machines, in which one of the knitting members above mentioned is stationary, while the other rotates; and in this way a largely increased product from the machine is secured.

OPERATIVE MECHANISM FOR NEEDLES OF A CIRCULAR KNITTING MACHINE.

The mechanism here illustrated consists in combining, with a needle cylinder having slots therein, preferably tapered, extending from the inner periphery outwards, in which slots are the needles, pivoted levers provided with jaws adapted to hold the shanks of the needles and, in such construction, with a knitting cam cylinder within said needle cylinder.

Figure 1 is a partial plan view of the needle cylinder.

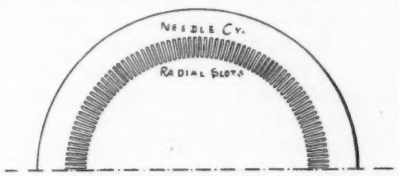


FIG. 1.

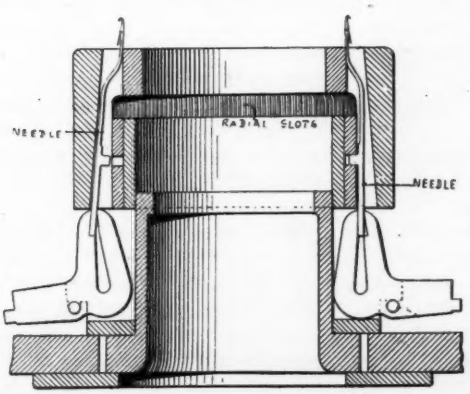


FIG. 2.

Fig. 2 is a vertical section through the knitting head showing the needles in and out of action.

It is claimed that this mechanism has many advantages over the combination of levers with needles in slots in the outer periphery of the needle cylinder. Among such advantages is stated: In some combinations when the needle is moved out of action it moves in at the bottom and where the needle rests against the needle cylinder, acting as a fulcrum, the hook of the needle moves outward, *i. e.*, toward the yarn carrier and has a tendency to strike it. This is detrimental to good knitting, as it tends to throw the yarn away or out of alignment with the active needle next to this inactive needle. This necessitates a fine adjustment of the yarn carrier.

In the present combination the needle moves in the opposite direction, the point where it rests on the needle cylinder acting as a fulcrum, the hook of the needle, if anything, is thrown away from the yarn carrier and carries the yarn which is held around the inactive needle into the hook of the active needle next to it.

In some combinations the needle moves toward the yarn carrier and thus carries the stitches which are already made toward the sinkers. When the needle is out of action the sinkers place a strain upon the stitch, and it requires a close adjustment to prevent cutting thereby.

In the present combination the needles moving in the opposite direction carry the stitch away from the sinkers so that no strain is placed on the same.

Again, in some combinations, the shoulder of the lever travels away from the needle and is made of peculiar shape to maintain operative connection. This requires a very fine adjustment.

In the present combination this is not required, as the shoulder of the lever and the end of the needle work towards each other and come together without friction. Finally, the motion of the needle lever is less, and therefore a fine adjustment of needle lever cams is done away with.

DYEING, BLEACHING AND FINISHING

BLEACHING OF "BLUE BENDER" COTTON.

CAN NOT BE BLEACHED TO A CLEAR WHITE.

A decision of considerable importance to the cotton goods industry was made last summer concerning the bleaching of cotton goods made from what is known as "blue bender" cotton, which failed to receive the bleach so as to be marketable.

The history of the case is briefly as follows: In September, 1900, a contract was placed through brokers with the Arkwright Mills, Fall River, Mass., by the H. B. Chaflin Company, New York, for 10,000 pieces of 38½-inch 64x64 standard gray goods. It was discovered after shipment of one or two lots that the bleachery could not turn them out satisfactorily, and after eleven shipments had been made, further deliveries were ordered stopped and 4,520 pieces were canceled. This cancelation the Arkwright Mills refused to accept. After correspondence covering a long period, 4,000 pieces were sold by the Claflin Company at a reduction of practically half a cent a yard from the purchase price, and a check for $2,724.31 sent the mills. This check was finally applied by the plaintiffs to the credit of the Claflin Company, and suit was commenced for the remainder of the contract price. The verdict for the plaintiff was for the full amount of the claim, namely, $2,148.48, including interest.

The decision was made more upon the significance and application of the contract under which the bleaching was done. The judge, acting as auditor in the case, laid special stress upon first quality as against second, and attached little comparative importance to the bleaching properties of the fabric. The opinion of the judge in brief was as follows:

"The defendants claimed that the cloth furnished was not first quality because as they held, it would not bleach, and the question came whether capacity for bleaching was or was not one of the things to be considered in determining the quality. The court finds that the goods are classified as to first and second quality, depending on their imperfections as to scratch-ups, thick and thin places, holes and uneven yarn. He does not find on the evidence that this classification depends on the bleachable quality of the cloth, and therefore that this cloth comes within the definition of 'quality first' required in the contract. I may add that there was nothing in the sale note which indicated to the seller that these goods were intended for the bleachery. Goods that are to be bleached are usually 38½ inches, wide, but goods of that width are used for other purposes.

"The question presented at the hearing whether the goods would bleach, therefore, becomes unimportant, but I have considered it and make a finding upon it. A sample of cloth made by the plaintiff from the same kind of cotton and sent to a bleachery was shown to me as evidence. To my unpracticed eye it seemed to be a white cloth, but I have no doubt that, speaking exactly, one would say it was not a perfect white. Indeed, I do not know that any cloth is perfectly white.

"But upon the evidence in the case, including testimony from persons engaged in the bleachery business, I find that cloth made from blue bender cotton can not be bleached to the same degree of whiteness as cloth made from other cotton.

"In accordance with my findings as previously stated, I do not find that there was any breach of contract by the plaintiff."

As the case is one of considerable moment to the cotton manufacturing industry, we communicated with the attorneys representing the plaintiff and defendant in order to learn more fully about the status of the litigation. The attorney for the plaintiff writes us that his client "relied chiefly on the proper construction of the sales note and did not go to any great extent into the question of bleaching 'blue bender' cotton. The auditor decided the case in favor of my client who presented a cut of the goods which it had bleached and which appeared to have taken a perfect white. What the auditor decided was that the term 'first quality' used in the sales note implied nothing as to the bleaching quality of the goods."

The attorney for the defendant writes us that "the reasons for the failure of 'blue bender' cotton to bleach white were not gone into with any care at the hearings before the auditor in the suit. On that point the issue was whether

or not it could be made white as compared with the bleach obtained in treating upland and other cottons of equally good grade. I consulted personally with many of the leading bleachers in New England and they were practically unanimous in their opinion, based on experience, that the blue bender gray goods were not susceptible to perfect bleaching. All but one of the witnesses were positive that no process could produce a white result and leave the goods merchantable. By that they meant that the cloth would be too tender for the market if subjected to treatment sufficient to whiten it. One bleacher was of the opinion that he could produce white cloth from this cotton, but his process he regarded as a trade secret and went only so far as to tell me personally in confidence that the method employed was not wholly chemical, but largely mechanical. By that I rightly or wrongly inferred that he meant the goods were subjected by him to some peculiar method of tendering."

Desiring comments from an expert bleacher concerning the bleaching of "blue bender" cloth we wrote to John P. Farnsworth, one of the most expert bleachers in Rhode Island, for his opinion. In response to our request he sent us the following communication.

Editor of Cotton:

You have asked me to write you my idea of the reasons why the so-called "blue bender" cotton that figured in the above case, did not take a bleach equal to that which can be put upon ordinary cotton. If I answer that the cloth was improperly treated, I believe I should be technically right, but such an answer would be entirely unfair to those who had the problem to work out. My modification of the answer would be "extenuating circumstances," for I doubt if any bleacher of market whites knows to-day of a process which will turn out goods, made from this grade of cotton, in as clear a white as can be shown on goods made from the ordinary white cotton.

The problem is not a new one. I have been in the business of bleaching cotton piece goods for some twenty-seven years, and I do not remember a time when there was not more or less trouble with "black cotton," as we call it. Sometimes goods appear to be made wholly of it. Sometimes it appears to be mixed, before spinning, with white cotton, and at times we find it in warp or filling alone. These variations probably occur when the mill is changing cotton and either putting in or getting rid of a lot of "blue bender."

At the time the goods in dispute were made there seemed to be a quantity of this cotton on the market. I know of one finisher who manufactures his own grade of cloth to a certain extent, and who prides himself that the goods he turns out are as near perfect as they can be made. At this time he came to me in despair with a sample of "blue bender" cotton of which he owned and had spun quite a quantity, and found himself unable to bleach his products so as to be salable. After consultation with a number of other finishers he sold his "blue bender," both in yarn and bale, and bought, as he buys now, only white, clean cotton.

We were, at the time, doing goods for the same purpose as those which Claflin was producing, and our correspondence shows that we refused to be responsible for the color of the finished product. But all this is not answering your question. The reason that this cloth did not take such a white as Claflin expected, and as was needed to make the goods merchantable, lies in our present knowledge of the treatment of this grade of stained cotton. I am using the word stained advisedly because from inquiries among cotton brokers for samples of this cotton, they speak of it as "stained."

The auditor, in his report to the superior court, speaks of this cotton as growing upon the bends of the Mississippi River "after" the land has received a deposit of mud brought on by freshets. I am not able to verify this statement, which was drawn from the testimony of cotton brokers at the hearing. It would seem, from what I am able to gather, that the cotton had suffered from a freshet when well grown. Perhaps some of your Southern correspondents know the actual facts. I have been unable to learn anything further as to the cotton from the U. S. Department of Agriculture.

Minutely divided and clinging to the fibers of the cotton is a dark coloring matter apparently of a clayey nature. This is probably insoluble in any agent that will not attack the cellulose of the cotton fiber. It is certainly unchanged by any of the ordinary chemicals used for bleaching. Mechanical treatment long continued, with washings between, seems to eradicate a portion of the color, but this treatment finally wears out the cloth before the goods are white enough to pass muster.

Of course in finishing goods some little account must be taken of the expense, and even if such goods could be made perfectly white by continued mechanical treatment the margin on such goods is so close that no finisher would undertake to guarantee white goods, except for glory.

Under the decision made by the superior court of Bristol county it would seem, therefore, that any converters buying goods from a mill likely to use "blue bender" cotton should exact from the seller a guarantee to use only such grade of cotton as can be bleached by the customary processes.

It was definitely understood by the trade in 1900, as it is to-day, that many of the 38½", 64x64 goods were used for white muslins and cambrics. If the Arkwright Mill were selling these goods freely it seems almost impossible that some of that cloth did not go to other firms than the H. B. Claflin Co., for converting into whites. It would therefore be probable that the mill had other complaints as to bleaching quality of these cloths, yet, in the face of this they send the Claflin goods to the Greenwich bleachery, where white goods only are finished.

The point that the court seems to have missed, or to ignore entirely, is that practically all cotton goods, except certain well-known constructions, are made to be converted into prints, colors or whites, and that goods sold as firsts should be of such quality, as regards material and manufacture, that they can be converted into merchantable cloth in any of the three styles.

JOHN P. FARNSWORTH.

SULPHUR BLACKS FOR HOSIERY.

YIELD RESULTS THAT MEET EVERY TECHNICAL AND COMMERCIAL REQUIREMENT.

BY A PRACTICAL DYER.

The most satisfactory and economical methods of producing fast blacks on cotton hosiery are those based on the use of sulphur blacks.

When these colors were first offered to the hosiery manufacturers, there was much diversity of opinion as to the permanence of the colors and the strength of the fabrics

dyed with them, but results obtained in the last two or three years have demonstrated conclusively that the sulphur blacks yield results that meet every technical and commercial requirement.

The sulphur colors have marked affinity for cotton goods and when dyed correctly and properly washed after dyeing, the result is a color which is fast to light, crocking and smutting and which will resist washing to the limit of endurance of the fabric.

Sulphur black-dyed hosiery has four great advantages over hosiery dyed with oxydized black.

(a) Simple dyeing method, a saving in time and consequently an increased production.

(b) The fiber is not weakened, therefore the number of "seconds" is reduced to a minimum.

(c) The colors are fast and will not turn green.

(d) Is not injurious to health.

A manufacturer contemplating entry into the hosiery manufacturing field would do well to thoroughly investigate the dyeing of sulphur blacks before equipping his dye-plant.

The machinery necessary is incomparably cheaper than that necessary for oxydized black, as a dye machine, or even an open tub, with a storage tank for the dye liquor, is all that is required: thus the "tom-tom" and the oxydizing cage are eliminated. In mills where oxydized black has been used, the same machinery can be used for dyeing sulphur black, provided that all brass and copper parts are removed; the sodium sulphide has an injurious effect on these metals.

For instance: The goods may be dyed one hour, in the chroming machine, the dye liquor drawn off into a storage tank and the goods washed in the same chroming machine. They are then taken out and put into the oxydizing cage to dry; from the oxydizing cage, they are put through the singeing machine, if necessary, then softened and boarded as usual. This is a very economical method in a plant equipped for oxydized black; a batch of hosiery can thus be turned out in about three hours.

It is a well known fact that when goods are dyed with oxydized black there is always the chance that they will be tendered, no matter how careful the dyer may be. The goods thus tendered are generally a total loss to the manufacturer, or, at the best, can only be sold as "seconds" at a greatly reduced figure. This can not occur when sulphur blacks are used, for experience has proved that if the goods are properly dyed and washed, they are not tendered in the least. This last feature is also of considerable importance in the dyeing of hosiery yarns. When oxydized black is used, the yarns are weakened and thus cause considerable trouble on the knitting machines, whereas, when sulphur blacks are used, the yarn is not weakened to any extent and for that reason works much better and with considerably less waste.

When dyeing with oxydized black, there is a great danger of the dye-house hands becoming poisoned; this poison manifests itself by an eruption of the skin, commonly known as "chrome sores." There is no such danger to guard against when using sulphur blacks, as they can be handled at will without any evil effects resulting.

These are only a few of the points in favor of the sulphur blacks, which have caused their adoption to such a large extent in the last three years, and, undoubtedly, they are the blacks of the future for hosiery. When sulphur blacks were first brought forward for hosiery dyeing by the color manufacturers, the dyer was cautioned against so many possible errors in their working that he was, in most cases, afraid to try them. He was cautioned against allowing the goods to rise above the surface of the dye liquor during the dyeing operation, against boiling the goods while dyeing and against exposing them to the air between the dyeing and washing operations.

While every care should be taken to insure good results, an infraction of any of the above rules will not result as seriously as at first supposed. For instance, in the paddle-wheel type of machine, the goods often rise above the surface of the dye liquor; still it is almost impossible to get uneven results on these machines. When the goods are boiled gently for, say, thirty minutes during the dyeing operation, the penetration is better than if the goods are not boiled; consequently the shade is more even and in most cases a deeper black results.

Before washing, the goods should not be exposed to the air unnecessarily; still, the time taken to transfer them from the dyeing to the washing machines will not have any injurious effects.

When working with sulphur blacks, two things should always be in the mind of the dyer; that is, to wash thoroughly and to use plenty of water. The best way is to wash twice in cold water and then in hot water at about 160° F. To this last wash water, a softener may be added if so desired.

The following formulas will give good results, as proved in practice.

For 100 pounds cotton hosiery:

7	pounds	Immedial Carbon B
7	"	Sodium sulphide conc.
2	"	Soda ash
10	"	Salt
8	pounds	Immedial Black W H conc.
8	"	Sodium sulphide conc.
2	"	Soda ash
10	"	Salt
7	pounds	Immedial Brilliant Black O conc.
7	"	Sodium sulphide conc.
2	"	Soda ash
10	"	Salt

The amounts given are for the standing bath; for the starting bath, one-third more color and sodium sulphide conc. should be used, with 5 pounds soda ash and 30 pounds salt, for every hundred pounds of goods.

The dye-bath is prepared with the necessary amount of water, (about twenty times the weight of the goods), the color sodium sulphide and soda ash being added. Bring the bath to the boil and boil until these ingredients are thoroughly dissolved; shut off steam, then add the necessary amount of salt and stir well until the salt is dissolved.

Enter the goods and work for about fifteen minutes; turn on steam, bring just to the boiling point and hold at this temperature for thirty minutes; shut off steam and allow the goods to feed in the cooling bath for from fifteen to thirty minutes; draw off liquor and wash as described previously in this article.

An addition of three pounds Turkey-red or Monopol Oil to the dye-bath will improve the shade and feel of the goods, but this is not absolutely necessary.

Imitations of indigo blues have been satisfactorily reached by combining naphthindone with alizarin on an iron mordant.

MARKET REVIEWS.

THE COTTON MARKET.

BY H. & B. BEER.

Now that the trade has settled on the probability of the crop of this year being about 13,500,000 bales, which we all along contended it would be, the question of demand becomes the paramount issue. Compared with one month ago values show but little change, for while prices at first suffered a decline of about $2.00 per bale, nearly all of the loss has been recovered. In the first instances, prices were made lower by the fulfillment of large crop estimates, as the Census Bureau reported 11,892,115 bales ginned to December 13th., compared with 9,284,070 bales last year, and 11,112,789 bales year before last, when the commercial crop was 13,511,000 bales, and the Agricultural Bureau estimated the season's yield at 12,920,000 bales, exclusive of linters and repacks, which usually amount to about 350,000 bales. The figures of the government estimate, however, are looked upon as being somewhat too small, for the reason that there had been as much cotton ginned in some of the South Atlantic States to December 13th. as the bureau allowed for the whole season, and nearly as much ginned to 13th. inst. in a number of other States. Nevertheless, the market has been doing better of late despite the crop promising to be of record-breaking proportions, it being realized that the world will probably take every bale market at existing relatively low prices, about $15.00 per bale cheaper than the average price of last season and about $10.00 per bale cheaper than the average price paid for the crop of year before.

From the time prices touched about 8½ for spring and summer months there has been a noticeable increase of orders for investment. The large exports thus far this season,—4,325,000 against 3,584,000 last year,—and spinners' takings since September 1st. of 4,675,000, compared with 3,945,000 one year ago, denote that mills are prepared to absorb this crop at prices perhaps higher than those now ruling, as there has been no let up in shipments to Europe or in spinners' takings, and it is generally thought that farmers will hold the remnant of the crop for better prices, as already there are signs of the movement to market falling off; for while receipts remain comparatively free they are of more moderate proportions. Of the two the contract market has been the stronger because of the support offered by Wall Street interests, and the small stock that New York has held up to a short while ago,—in some cases futures command a premium on spots.

Of late, the stock at New York has increased materially, and it may be a more difficult task to hold the market in the future unless business,—which has improved in the United States to such an extent that conditions are almost in a normal state,—picks up in Europe, particularly in England, or unless there should occur a perpendicular falling off in receipts.

Believers in better prices for cotton pin their faith on the large absorption of cotton, the exceptionally superior quality of this year's crop, and the comparatively low price, which they contend, is all the cheaper because of its superior spinnable quality, that it will go further by furnishing more cloth to the pound than the character of crops usually raised. Aside from these features there are the possibilities in the way of uncertainties attending preparations for the new crop. This year the crop was large, despite the weevil in the Southwest, because of a good planting season and ample rains during the summer, especially in Texas where the crop will be about 4,000,000 bales, or about as big as any ever raised in that State.

The weather in the South this fall and thus far this winter has been very mild and dry, especially in the Mississippi Valley and Texas, and it is feared that we will have a wet spring since the law of averages applies to nature as to anything else. Early planting will be urged in the Mississippi Valley to get ahead of the weevil, and aside from the danger of the possibilities of a wet planting season, late frosts are to be feared, as replanting on that account would be made necessary. Then again, in the event of a wet spring, chances would favor a dry summer, perhaps a drouth, and there is nothing that would cut the crop short as would a drouth during the summer, especially in Texas, as was the case in 1907, when only a half crop was made because of the want of sufficient moisture during the period of high temperatures. Therefore, it is probable that the large absorption of cotton, as is indicated by the record-breaking takings by spinners, is due more to the desire on the part of mill men—except in New England where business with the mills is good—to lay in a large reserve of good spinnable cotton at prices relatively cheaper than for a number of years, than to prospects for a very large consumption this season, made almost impossible by the state of trade abroad. Nevertheless, the fact remains that prospects are for the whole crop passing into the hands of the spinner and thereby become a part of the invisible reserve, and, in event of a wet spring or a drouth next summer, higher prices for cotton are not at all unlikely.

THE COTTON YARN MARKET.

Since our last review there has been a radical change in conditions. A number of the mills which have been holding yarns at very high prices have been obliged to come into the market for orders to keep their machinery going, at cut prices. For instance 20/2 ply to be made was quoted by a great many spinners at 21 cents, and the same mills have taken orders at 18½ cents and some are reported at 18 cents. On 40/2 ply some of the mills which quoted 28 cents were anxious to take orders at under 25½ cents a few weeks later. The situation as it appears at this writing is that until the stock of yarn which the dealers have has been worked up there will not only be no advance in price, but the market conditions will remain unsatisfactory.

Some of the yarn is coming along in very large quantities and forwarded to the warehouse, and the owners of it, as far as they can, are selling it at even less than the price which they paid in order to obtain their money, which, of course, is all demoralizing.

In addition to that we have been in the dullest season of a dull year; at a time when nobody is paying attention to staple lines, and the trade preparing for the holidays.

The retail trade is good, and especially in the holiday goods, and within a short time the buyers will be taking up the question of more serious supplies, such as standard goods.

The outlook for the coming season is good. There will be an excellent demand for yarn, and consequently for cotton. In case there is no decided break in the price of staple yarns there should be a moderate advance, and it looks as if the market will hold after a time on a basis of 19 cents for 20/2, and other numbers proportionately.

There has been a weakness in hosiery yarns on account of the inability of the large Eastern mills to get sufficient work, not only to take care of the stock on hand which they accumulated while the consumers were not running, but also to take care of the product which is continually coming forward, and for this reason the Northern spinners of mulespun yarn have taken orders at lower prices than a great many Southern frame spinners would entertain. Southern mills will feel this a little later.

There is a good volume of business to be placed during the next three or four weeks, when the buyers who have been holding back and using up their low priced orders again come into the market. This buying may occur around the first of the New Year, it may be the first week in January, or it may be the middle of January. It all depends upon their circumstances, but the buyers can not put off buying very much longer, as they have got to have yarns come forward for February delivery.

We quote:

SOUTHERN SINGLE SKEINS.

4s to 8s	15 @15½	22s	18½
10s to 12s	16 @16½	26s	19
14s to 16s	16½@17	30s	21
20s	17½		

SOUTHERN TWO-PLY SKEINS.

4s to 8s	15½	30s	21
10s to 12s	16 @16½	36s	23@24
14s	17	40s	25@26
16s	18	50s	32
20s	19	60s	38
24s	20	8-ply 8s upholstery	16
26s	20½	4-ply 9s upholstery	16

SOUTHERN SINGLE WARPS.

8s to 10s	16	22s	18
12s	16	26s	19½
14s	16½	30s	21
16s	17½	40s	24
20s	17½@18		

SOUTHERN TWO-PLY WARPS, ETC.

8s to 10s	16½	26s	20½
12s to 14s	17 @17½	30s	21½
16s	18	40s	25½@26
20s	19½	50s	32
24s	20 @20½		

SOUTHERN FRAME PEELER CONES.

8s	16	20s	18½
10s	16½	22s	19
11s	16¾	24s	19½
12s	17	26s	20
14s	17½	30s	20½@21
16s	18	40s	25
18s	18½		

KNIT GOODS MARKET.

The knit goods market still continues to exhibit a healthy tone, and the prospects are extremely favorable for a prosperous year for 1909, notwithstanding the year has commenced in a quiet way due very largely to stock taking, which has been going on for several weeks but will soon be closed, and renewed attention given to meet the necessities of the trade. Orders from the distributing centers are coming in with much irregularity, though, as a whole, agents and manufacturers express themselves as having little to warrant them to complain, and many sale houses report that they have increased their initial orders. Wherever buyers have declined to place orders it has been for reasons other than dissatisfaction with the quality of the goods or the prices asked. As is characteristic of the trade at the beginning of a year there is no uniform rule as to the volume of business at distributing centers. The decline in the price of yarns has had an effect upon the price offered for goods, and many buyers are inclined to look for further decline, which position, however, is not believed in by manufacturers.

While some merchants report as not having done well on their spring products, it is not looked upon as being a rule. Manufacturers of fleece lined hosiery are doing a satisfactory trade for the fall demand, and it is evident that there is an under-production of the better class of goods, which buyers become to realize when they try to make purchases for fall delivery.

Mills in different parts of the country are operating their machinery over-time, and this applies to mills in New York, Connecticut, Pennsylvania and elsewhere. We note that some of the mills on balbriggan underwear, gloves, linings, etc., are conducting their knitting departments night and day, and their carding and spinning departments overtime. It is no unusual thing to note the resumption of operations on full time on the part of mills that have been running short time for many months. It is beginning to be believed that the manufactured product on hand will not come near to supplying the demand, nothwithstanding the apparent fact that sales are being made only in small lots. There is a good demand for cheap heavy-weight underwear and no abatement in the calls for sweater coats. These manufactures, it is thought in some quarters, will be overdone, because of their present large production. A few mills are operating their machinery, or some portions of it, night and day on the medium grades of this class of goods.

SOUTHERN COTTON MILL STOCKS.

Quotations by F. C. Abbott & Co.,

Charlotte, N. C.

	Bid	Asked
Aiken Mfg. Co.	75	85
American Spinning		150
Arkwright Mills		
Arlington		156
Avondale	115	125
Augusta, Ga.	65	70
Bonnie	121	
Bloomfield		118
Brandon Cot. Mills	126	131
Brookside		
Capitol City, pref.		96
Chadwick-Hoskins Co.		100
Clara		121
Clover	150	
Clinton		133½
Clinton, pref.		103
Cliffside	155	
Chiquola Cot. Mills	124	
Cherokee Mfg. Co.		
Converse		117
Dallas Mfg. Co., Ala.		100
Dillon	60	68
Efird, N. C.	133	
Elmira, pref.		98
Eagle & Phoenix		128½
Easley		151
Edenton, N. C.		
Exposition		240
Fairfield	75	80
Florence, N. C.		131
Gaffney Mfg. Co.	66	70
Gaston		100
Gainesville	49	
Gibson	95	99
Graniteville, S. C.	160	
Gray Mfg Co.	121	126
Grendel		119
Greenwood		97
Highland Park		170
Hartsville pref.	100	
Hartsville		
Inman Mills S. C.		107
Kesler	135	140
Jno. P. King Mfg. Co.	90	96
Lanaster, com	119	
Lanett		121
Langley Mfg. Co.	90	96
Linden, N. C.		125
Limestone		161
Loray, pref 1901		93
Lowell		201
Mooresville, N. C.		
Lumberton		226
Mills Mfg. Co.		106
Modena Mills		125
Mollohon		
Monarch, S. C.		101
Newberry		146
Nakomis N. C.		156
Olympia, 1st	65	
Ozark		151
Patterson		150
Piedmont Mfg. Co.		176
Pelzer		
Pell City, com.		95
Pell City, pref.	100	
Saxon		126
Sibley, Ga.	60	
Social Circle	99	
Spartan Mills		
Springstein		
Statesville Cot. Mill	115	
Trenton, N. C.		
Tryon, N. C.		143
Tuscarora	115	
Tucapau, S. C.	200	
Toxaway	94	96½
Union Buffalo, 1st pref	55	66
Union Buffalo, 2d pref	17	21
Victor Mills, S. C.	12	131
Warren Mfg. Co., pref	103	
Washington Mills	25	
Washington Mills pref.		118½
Watts		101
Wareshoals		
Whitney		125
Wiscassett	180	
Woodside	102	105
Woodruff		126
Williamston		108

NEW ENGLAND MILL SHARES.

Name of Mill	Bid	Asked	Name of Mill	Bid	Asked
Amoskeag Mfg. Co	285	277¾	Great Falls Mfg. Co	149½	175
Arkwright Mills	98⅝	...	Granite Mills	...	150
Androscoggin Mills	150	155½	Gosnold Mills Co.(pfd)	100	105
Arlington Mills	128	141½	Grinnell Mfg. Co.	190	...
Atlantic Cotton Mills	60	74¼	Lawrence Mfg. Co.	130	145½
Acushnet Mill Corp.	...	...	King Philip Mills	...	...
Barnard Mfg. Co.	...	112	Mass. Cotton Mills	90	123
Bates Mfg. Co.	195	222½	Merrimack Mfg. Co.	82	40½
Bourne Mills	...	95	Merrimack Mfg.Co. pfd.	75	88½
Border City Mfg. Co	144	145	Pocasset Mfg. Co.	...	...
Cabot Mfg. Co	...	...	Pepperell Mfg. Co.	275	294
Chase Mill	125	130	Seaconnett Mills	77½	80
Cocheco Mfg. Co.	...	...	Trem't & Suffolk Mills	85	98¼
Everett Mills	125	135¼	Wampanoag Mills	95	97½
Flint Mills	...	106	Wamsutta Mills	125*	...
Franklin Mill Corp.	106¼	106½	* Ex-dividend		

Cottonseed meal is worth $25.00 a ton because it contains 40 per cent. of protein and 10 per cent. of fat. Prairie hay is worth about $5.00 a ton because it contains only about 4 per cent. of protein and 2 to 3 per cent. of fat. Alfalfa hay is worth $10.00 a ton because it contains about 14 per cent. of protein.

No bad effects are noticeable from the practice of feeding cotton meal and corn silage separately. On the contrary, such a practice appears to have distinct advantages over the common practice of mixing the meal with the roughage.

The Textile Mill Situation in New England and the South.

NEW ENGLAND MILL SITUATION.

(*Special Correspondence.*)

After a year of gradual restoration of confidence and slow price recovery from the panic caused by excessive prosperity, the textile industry has regained its economic equilibrium and is now marching with the forces that make for industrial and commercial expansion and progress. Students of the textile industry who consider conditions from a strictly economic viewpoint are unanimous in the opinion that of all the fundamental industries of this country the cotton industry has the greatest and most justifiable reason for expansion.

The year 1909 will witness a gradual and conservative expansion of cotton mills in the United States, and by the time full prosperity has been regained our domestic production of plain and fancy goods will be sufficient to take care of a greater percentage than ever of the home demand, and give us a more commanding position in securing export trade to the Orient and to South American countries. This may appear to be an ultra-optimistic opinion, but the conditions as they appear to-day justify this optimism.

The new year comes in with raw material selling at about the lowest point, and of excellent spinning quality. Retailers are bare of goods, stocks of finished goods in the hands of commission men are low, and grays in the hands of the mills are reduced to practically a normal basis of surplus. These statements are reliable for the writer has called on many large commission houses in the cities of Boston, New York and Fall River and some of the expressions of opinions that he secured would make most interesting reading. As an illustration, one of the largest houses in Boston, that controls a number of Southern mills, has fewer goods to offer to-day than at any time in eighteen months, and their mills are operating at 90 per cent. of normal. One of the partners of this house stated that, in his opinion, raw material was at the extreme low point and for the next six months the price of finished goods would depend upon supply and demand for finished goods and not upon supply and demand for raw cotton. It is his opinion that raw cotton will have a smaller influence on prices for finished goods than for several years and he has advised his customers not to guage the market for cotton ducks and fancy goods by the price of raw cotton. This gentleman is unwilling to make a contract for 1909 for duck and ticking from two of the mills he controls at 15 per cent. advance in price over the prices he is securing to-day.

Note the courage and conviction of Eugene N. Foss, of Boston, who is promoting a $5,000,000 cotton mill to be located in East Boston, Mass., a spot remote from any textile manufacturing center, and the gingham interests in New England which are putting several thousand more looms in the Amoskeag plant, 1,200 in the Everett Mills, Lawrence, and a large addition to the York Mills, Saco, Me. All of this means progress and prosperity for the New England cotton industry, and is justifiable from an economic standpoint.

December has been a month of inactivity, as usual. Yarns have held firmer than many expected, although there has been price cutting in weaving yarns, but nothing alarming. Skeins and warps sold off the middle of December. Increased production in the South temporarily set the Northern market back, but the reaction was largely sentimental as few shipments of yarns have been made except on contracts. Braid manufacturers are putting on more braiding machines and there is a better feeling in the hosiery trade.

Western buying of prints has held the market steady and few concessions have been made. The Fall River market is well cleaned up and sold ahead to April, so it is not expected that there will be any material concession even if business doesn't improve after the turn of the year. Ticks, ducks and denims hold firmly with an upward tendency, while sheetings are inclined to sell off in order to induce buying. Drills have held their advance remarkably well, especially 2.50 and 2.85s which are selling at top prices. Overall manufacturers are covering their spring deliveries this month and prices will probably strengthen further on the 2.85s.

Exports of domestic cotton goods from the port of New York for the year 1908 to December 14th, total $11,594,584, as compared with $10,885,710 for the same period in 1907. Heavy shipments of denims have been made to Australia at firm prices, and 1,000 bales of three-yard sheetings were exported to China at 6⅛ cents, which is the top price on this class of goods for some time. Pepperell drills have been shipped nearly every week to the Orient at prices not made public. The demand for sheetings from South America has not been so great as in November when prices were slightly lower than at present.

Several textile machinery houses and belt makers have announced an advance in prices to take effect this month. The demand for textile machinery is heavy and extends from Canada to Georgia, and as far west as the Mississippi. The Draper Co. is having large repeat orders for looms

and other machinery and report a radical improvement in business. Many New England mills, with old time machinery, are throwing out their old looms and spinning machines for more modern equipment. The mills controlled by John W. Danielson, Providence, R. I., which include the Quinebaug at Danielson, and the Wauregan at Wauregan, Conn., and the Lockwood at Waterville, Me., have all announced extensive improvements. These mills have been a number of years behind the times, but since the appointment of J. Arthur Atwood as general manager of all of the Danielson mills, a policy of improvements and extensions has been outlined that will modernize all of these mills and place them in an enviable position.

The discount on belting is to be reduced because the packers are in absolute control of the hide market at the present time, and prices are soaring every week. Many large tanners are putting stock through on consignment for the Chicago packers, especially the heavy hides. This is a condition that has never existed before.

The cotton mill share market holds at highest prices with no great quantity offered. Although investors appreciate that textile mills have had a hard year, there appears to be no limit to the demand for the high-grade stocks such as Pepperell, Bates and Amoskeag. Massachusetts mill stock has advanced from par to 122 this last month, and there are fifty shares offered now at a limit of 125. This mill has paid 8 per cent. dividends and accumulated a large surplus as well as a floating debt. It controls the Massachusetts Mills in Georgia. Sales of Bates at 230 have been reported and brokers report a market for a large number of Androscoggin although none is offered.

Fall River stocks are holding at their best prices with light offerings. New Bedford stocks are reaching record prices and there appears to be no limit in price for such stock as Dartmouth which was sold at $400 and Pierce which sold at $340. Grinnell has gone to $190 and Acushnet to $325.

During the year textile securities have advanced heavily and the public interest never was greater. Boston brokers are segregating their textile business because of the greater public interest, and are looking for a very much broader market than has ever existed.

NEW ENGLAND COTTON MILL INDUSTRY.

(Special Correspondence.)

Business is better in the New England cotton mills than it has been for several months, and the feeling among mill managers and employees is steadily becoming optimistic over future prospects. Operatives are working overtime in the Appleton, Merrimack and Lawrence mills in Lowell. The Hamilton Manufacturing Company's print works have been over-crowded with work. The Musketaquid Mills have been running nights in order to keep up with their orders. The Talbot and Faulkner mills at North Billerica have more business than heretofore. The Draper Company at Hopedale has been receiving increased orders for looms and other mill equipment. Many established mills have been ordering new equipment to replace the common looms used in weaving all varieties of fabrics, and during the past six months 12,000 Northrop looms have been ordered.

MASSACHUSETTS.

At a meeting of the directors of the Taber Mill, New Bedford, it was voted to increase the number of spindles in the mill by the addition of 10,000, which will bring the equipment up to 60,000. It is expected that the machinery will be in operation by the last of February. The finances of the mill are in excellent condition, and the stocks and bonds are in good demand; a recent sale of one hundred shares brought $90, and a bid of par and interest for $5,000 of the convertible bonds was refused.

The Harding-Whitman interests, which control the Whitman, Manomet and Nonquit mills, are reported interested in some plans for a new spinning mill to have an outfit of over 60,000 spindles, the work of construction to begin in the spring.

Stockholders of the Sagamore Mills, Fall River, have been notified of the increase of the capital stock from $900,000 to $1,200,000. The new stock is offered at par until February 1, after which date all remaining untaken will be sold at auction. Since the old stock has recently sold for $167.50, it is believed that the new stock ought to command a good premium.

Insurance rates on cotton from the South to Fall River have been reduced 20 per cent. Under the old rates the cost of insuring 50 bales of cotton valued at $2,500 during transit was $3.06; the new rate is $2.45. This rate applies to shipments both by rail or sea.

The stockholders of the Everett Mills, Lawrence, have voted to increase the capital stock of the mills by doubling the stock, making it $1,400,000, one share of stock to be issued at par for each share of old stock. From the money thus secured it is proposed to build a new mill, which the disturbed financial and industrial condition has prevented being attempted before this.

RHODE ISLAND.

The Greystone Mills, Greystone, and the Bernon Mills, Georgiaville, are planning extensive improvements. A new addition has been completed to the Bernon Mills and the machinery is being installed. Six hundred Draper looms will be included in the equipment. The first floor will be used for a cloth room, the second and third for weaving, and the spinning machinery will be on the fourth floor. The old spinning department has been improved by the introduction of six Whitin frames for warps, and 50 filling frames have taken the place of the old mules. It is proposed to install a new engine of sufficient power to run the entire plant.

After being closed for more than a year the Akela Mill at Pascoag, is again in operation. A new dye house is in process of construction. The Mohegan Mill is building an addition two stories high to be used as a weave shed and sewing room.

Important changes are expected at Pawtucket in the plant of the Royal Weaving Company, as plans have been made for building two new mills, into which the present business will be consolidated when completed, and the two now occupied abandoned. One of the new buildings will be two stories high, 175x500 feet area, with a sawtooth roof. The lower floor will be used as a cloth and shipping room, and the second floor will be the weaving room with 1,008 looms. The other building will be two stories, 100x500 feet area, to contain the warpers and spoolers. The materials to be used in these buildings will be brick and white granite, and work will be in progress as soon as the plans are completed. The plant will give employment to 800 persons.

The Warwick Lace Works, Riverpoint, have been run-

ning day and night. The sixth new lace loom has recently been set up and put to work.

The B. B. & R. Knight Co., which operates several large mills in Rhode Island and Massachusetts, employing 8,000 persons, is looking forward to the largest business season in the history of the company. The selling agent of this company has recently advanced the price of "Fruit of the Loom," 4-4 bleached, to 8¾ cents, and ⅞ bleached to 7¾ cents.

CONNECTICUT.

As a result of the rains which have been enjoyed the early week of December, the textile industry in Connecticut has been saved from considerable embarrassment, the mills having had sufficient water to enable them to continue operations.

The Quinebaug Company, Danielson, is making changes in its mill by removing all the old style looms and replacing them with 480 Draper looms. The present equipment includes 220 Draper looms, so when the new ones are installed the plant will have 700 in the lower weave shop.

The Pequot Mills, at Montville, have been bought by Charles D. White, who has been overhauling the plant and putting in new machinery where needed. A large amount will be added and the capacity of the mill increased. About 100 persons will be employed.

MAINE.

The York Manufacturing Company, Saco, is planning to develop the land on Factory Island, on which it has had an option for some time, and in the early spring begin the erection of a weaving mill. The new power house of the corporation will be completed before next summer, and the cloth hall will be enlarged about one-third.

The Dana Warp Mills, Westbrook, have been so rushed with work recently that the company is considering the erection of a new building, and work will probably be commenced very soon, so that it may be occupied next fall. At a recent meeting of the stockholders it was voted to increase the capital stock from $195,000 to $300,000.

Having been idle for a year, the Knapp Spinning Mill, Richmond, has resumed operations. At present the force employed is small, but it will be increased gradually until the full complement is employed. The mill is producing carded and combed Egyptian yarns. The plant has 5,000 spindles.

There has recently been incorporated in Maine the Troy Bleaching Company, with a capital of $300,000, the object being the bleaching, shrinking, printing, dyeing and finishing of cotton piece goods. The business will be located in Troy, N. Y.

NEW HAMPSHIRE.

The people of Manchester are congratulating themselves on the announcement of the Amoskeag Manufacturing Company that it is the intention of that corporation to build more mills in Manchester, plans for which and location having been already decided on. This new enterprise will add between 3,000 and 4,000 more people to the city as employees, and with their families the city's population is expected to make a marked increase. It is also understood that the company will go to the legislature with the request for a charter to build a dam on the Merrimack south of Goff's Falls, which will develop several thousands of horse power, that in the form of electricity can be transmitted to the plant in Manchester.

SOUTHERN TEXTILE MILL NOTES.

(*Special Correspondence.*)

Considerable interest was taken in the meeting of the Southern Textile Association, held in this city on the 26th. inst. A large number of master mechanics, overseers and mill superintendents from all over the South attended and the discussions entered into were helpful and instructive. This was the second meeting of this newly organized textile association, and it was decided hereafter to hold four meetings a year, the next to be held in Greenville, S. C., in April. A number of interesting papers were read, among them being one by W. A. Graham Clark, special agent of the Department of Commerce and Labor, on "How Waste Products Are Utilized in Foreign Countries;" one by W. S. Lee, of the Southern Power Co., of Charlotte, on "Power Transmission;" one by E. A. Ascott, secretary of the Raleigh and Neuse River Cotton Mills, on "Earning Capacity of the Mills;" and one by B. C. Cottrell, of the G. M. Parks Co., on "Value of Humidification." Following the reading of these papers many questions were asked concerning matters of interest and discussions followed. In the absence of J. A. Dean, president of the association, David Clark presided over the meeting.

There has been a great shrinkage in mill construction in the South during the year 1908. In fact, the year is noted chiefly for the heavy decrease in the number of mills built and spindles installed, as well as the large extent of curtailment of production among mills already established.

North Carolina leads the list of Southern States in mill building for the year, 15 new mills having been established with 52,693 spindles. Two new mills were built in Georgia having 10,000 spindles and 240 looms; four in South Carolina with 23,500 spindles; one in Alabama with 5,000 spindles, and one in Texas. Nine new knitting mills were established in North Carolina; two in Georgia and one in West Virginia. The decrease in the installation of spindles in new mills for 1908 in the South is clearly shown by the following comparative reports for ten years past: 1908, 91,193 new spindles; 1907, 294,745; 1906, 294,956; 1905, 97,920; 1904, 55,472; 1903, 281,752; 1902, 490,256; 1901, 259,360; for 1900, 109,584; 1899, 669,970.

This heavy shrinkage was also felt keenly by lumber dealers of the Southern States. The drop-off in the demand for heavy construction materials forced the closing down of many large lumber mills all over the South. It is roughly estimated that 200 lumber mills in North Carolina closed down during the panic. As an indication of the improvement of general conditions it may be stated that the majority of these mills are running again. It is estimated that fifty per cent. of the lumber mills in Virginia have resumed work, and similarly encouraging reports come in from other Southern States.

Present indications point to a busy season during 1909 in construction work. During the past two months a decided improvement has been reflected in the textile industry. Numerous new mills have been organized and chartered; others that were planned for when the panic broke out, and given up temporarily, are to be built this year. A large number of established mills are installing additional equipment for increased production. Prices on yarns and other goods have forged steadily upwards during these two months, and with the lull, which is usual at the holiday season passed, it is the confident belief of well

versed mill men that 1909 will be a busy year among Southern mills.

A word regarding the curtailment during the closing year. A well posted mill man estimates that production among all Southern mills was cut at least 25 per cent. This is probably putting it mildly. T. W. Crews, secretary of the Southern Hard Yarn Spinners' Association, whose home is in Charlotte, tells your correspondent that he estimates yarn mills curtailed to the extent of 50 per cent. during the year. Mr. Crews states he believes prices of yarns will continue to advance from now on, and that further curtailment will not be necessary.

Most of the mills of the South are running now, and during the past few weeks a number have gone back to night work. It is the general opinion that operations will proceed without interruption. It is not necessary to state the meaning of this to the great army of mill operatives who for many months have been out of employment. In so far as your correspondent is able to learn little difficulty is being encountered in obtaining help to operate mills. The disorganization of forces feared by many did not occur, at least, not to any great extent.

On the whole, the situation affecting the textile industry of the South is as encouraging as could be expected at the end of a year as disastrous to business as that just closed. Not a phenomenally large business, but a good, conservative, substantial business for 1909 is anticipated by mill men interviewed, and everything seems to point in that direction.

Considerable interest has been taken in the trial of several prominent cotton mill men in North Carolina recently charged of peonage. The cases all fell through and Judge Boyd roundly criticised the government's representatives for bringing suits on such feeble ground. He commended the jury's verdict of not guilty. The cases grew out of an action taken against mill operatives to force them to work out money advanced for transportation. Defendants in the cases were: A. E. Moore, B. J. Dobbins and C. J. Huss, of the Loray Mills, Gastonia, N. C., and J. W. Primm, superintendent of the Anchor Mills, Huntersville, N. C.

The outlook for foreign trade in American cotton manufactures, is good, according to W. A. G. Clark, who has just returned from a two years' trip abroad. Mr. Clark's investigations were conducted under the direction of the Department of Commerce, the work having been taken up at the instance of the American Cotton Manufacturers' Association. Mr. Clark has just been in Charlotte and while here gave out some interesting information relative to the outlook for export trade. He says in regard to the trade in China and other countries:

"American manufacturers have a good trade in China in sheetings and drills, but in white shirtings and tea cloths we allow the English to monopolize. I travelled 600 miles in Manchuria, and there, 100 miles from any railroad, I found goods of the Loray, Henrietta and other North Carolina cotton mills, and indeed of many other Southern cotton mills. The Southern mills have been controlling the trade in Manchuria, but we are allowing the Japanese to encroach upon us. They are doing so by the use of cheaper material,—they mix American and Indian cotton,—and by their cheaper labor. Eleven cents a day is the average wage for work in Japanese cotton mills. At Kirin, in interior Manchuria, I found $1,500,000 of Southern cotton manufactures stored. We have had as much as 90 per cent. of this country's trade in the past. Our goods are sent to Shanghai merchants and by them to Manchuria. The Japanese now have an agent or agents in Manchuria, and are in this way winning from us our trade. There should, by all means, be an American mill representative at Niuchwang.

"I believe it would be well to advertise the 'chop' on our goods in Manchuria by posters on the town-walls which is the native way of advertising. The Manchurians have become familiar with our 'chop,' or mark, on the goods. In the advertisement it should be stated that our goods are made out of pure American cotton, and are, therefore, stronger than those of the Japanese manufacture, made of mixed cotton."

Mr. Clark's special work in Asia was the study of markets for the sale of American goods, and, in Europe, the methods of our competitors. Incidentally on his trip Mr. Clark states that he convinced himself that the Southern States' monopoly of the cotton trade of the world would never be in danger. He seems to be of the opinion that our export trade may be greatly increased during the coming year if better methods are employed, and, before leaving for his home in Raleigh, N. C., spoke encouragingly of the outlook in foreign countries to the American manufacturer.

ARKWRIGHT'S DRAWING FRAME.

Drawing or lantern frame.—Made by Arkwright about the year 1775, and was known as the "lantern frame," owing to the fact that the carded sliver was delivered by the drawing rollers into a can with an opening in the side, closed by a door through which the sliver was removed, and so somewhat resembled a lantern.

The object of this machine was to make the sliver finer, and this was accomplished by passing the cotton through two pairs of rollers; the second pair revolving more quickly than the first, delivering a greater length than was fed up, and so the material was made thinner and longer. The distance between the two pairs of rollers was rather more than the length of the fibers or the "staple" of the cotton, so that the drawing only slid the fibers upon each other without stretching or breaking them. The process was repeated several times until the requisite tenuity was obtained.

After passing through the drawing rollers, the sliver was led down through a short tube to a pair of smaller rollers attached to the top of the vertical can or "lantern." The can was driven by a band from the main drum, and on its axis was fixed a pulley from which a band passed over guide pulleys to the pair of rollers on the can, and they fed the cotton into the can at a definite speed while the turning of the can put a slight twist into the sliver.

A ration consisting of cottonseed meal and good corn silage is consumed by cows with great relish, which is in no way lessened when the feeding of such a ration is continued for a period of five months.

A line of work which should be carrying on, and which would be of more particular interest to the cottonseed oil mill men, is the experiments with cottonseed meal and cottonseed to try and establish the relative value of meal and seed as fertilizer for cotton.

NEW MACHINERY AND TRADE NOTES

TAYLOR & FENN COMPANY.

A TEXTILE MACHINERY PLANT.

The Taylor & Fenn Company, Hartford, Conn., has recently completed extensive alterations in its plant so as to increase its facilities and better accommodate the manufacture of its textile machinery. These additions have been made necessary because of the large increase in the amount of business that has pressed upon the company within the last few years. During the past year the business depression was such as to afford the company an excellent opportunity to make the necessary changes without any serious inconvenience in the operation of its plant.

The plant as now equipped consists of a machine shop, pattern shop, and foundry, with complete accommodations for turning out all parts of the machinery made by the company.

The accompanying illustrations show an exterior view of the plant and three interior views of portions of it. One of the new buildings is a machine shop, two stories high, built of brick and concrete, 40 feet wide and 160 feet long. The floor space in the machine shops has been increased to about twenty thousand square feet, the shops being most conveniently arranged and equipped for economically handling both heavy and light work.

Besides the regular equipment of machine tools, there has been installed a large number of special and automatic machines adapted for the economical production of certain parts. In connection with the machine shops is a well-arranged tool room and a large stock rpom for finished parts.

The pattern shop has a complete equipment of modern wood-working machinery, and is located in a new two-story brick building 30 by 80 feet.

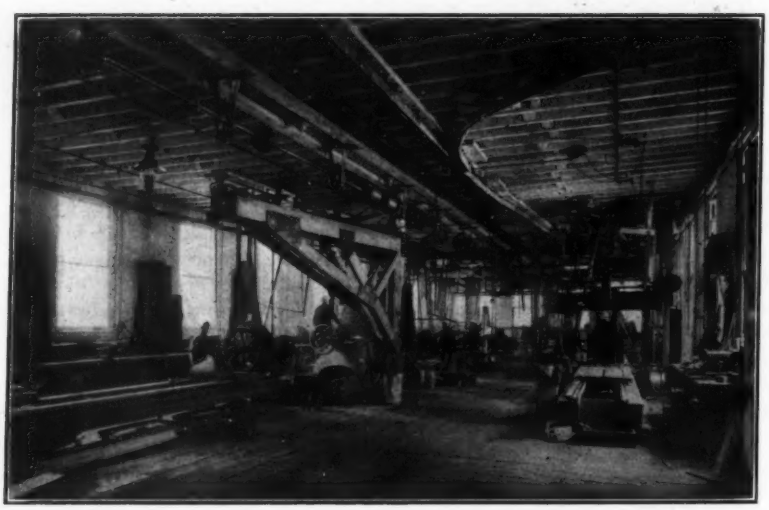
EXTERIOR VIEW OF TAYLOR & FENN CO.'S PLANT.

A portion of the iron foundry is here shown, the main building of which is 60 by 200 feet, and with wings and core room occupies a floor space of about 18,000 square feet. The foundry has a melting capacity of 15 tons per day, and crane capacity of 10 tons. The cleaning and shipping departments are equipped with an overhead trolley system for the economical handling of material.

A compressed air plant has been installed which fur-

FOUNDRY.

THE MACHINE SHOP.



ASSEMBLING ROOM.

nishes this power to all parts of the plant. In the machine shop air is used for operating drills, hoists, etc., and in the foundry it is used for the elevators, hoists, chipping hammers, for cleaning castings and for operating the molding machines, a large number of which are now in use in this department.

Adjacent to the foundry is a fireproof pattern storage which is steam heated in order to keep the patterns at a uniform temperature.

The entire plant, covering over 55,000 square feet of floor space, is now protected against fire by a complete automatic sprinkler system.

The plant is particularly well located in regard to shipping facilities, both by rail and water.

In addition to its well-known line of bleaching, dyeing, drying and finishing machinery, this company manufactures a line of machine tools and designs and builds special machinery, and in addition to its machine lines makes gray iron machinery castings.

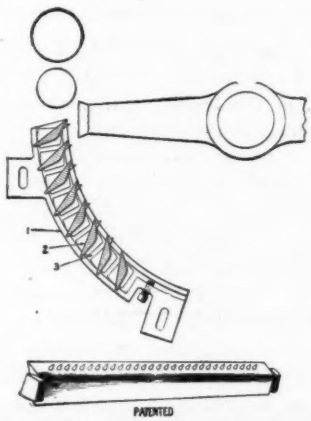
PIN GRID BARS.

We illustrate herewith the Atherton pin grid bars for cotton openers and lappers, made by Atherton Pin Grid Bar Company, 23 Weybosset St., Providence, R. I. The benefits claimed as being derived from the use of these bars are the superior manner in which they open and prepare the cotton, and by means of which the dirt and leaf in the cotton is loosened and falls beneath the bars. Owing to the method of opening of the cotton the latter is lightened up in such a manner that it passes forward to the

wire screens without being knocked below the bars by the action of the beater as in the case where the cotton passes through the pickers in a bunchy condition. This means less waste of good cotton under the bars besides a better preparation of the cotton for the carding machines.

Referring to the illustration: No. 1, is one of the circles that hold the grid bars in the machine. No. 2, are grid bars containing the pins one half inch apart. No. 3, is a space between grid bars on the ends of the same.

In order to adjust the bars so that the greatest amount of foreign substances may be removed and the smallest amount of good fiber wasted, pieces of leather of different thickness are placed between the bars in the circles. To perfectly adjust these bars one should experiment until the smallest amount of fiber is seen under the beater. Once adjusted, one will find he saves a comparatively large amount of cotton per day, and that the bars take out a large quantity of dirt. The bars are made of specially drawn steel which gives a superior edge. They contain steel pins which are forced into them by a great pressure, the object of the pins being to so soften the cotton passing over them that a greater amount of foreign substance is allowed to drop from the cotton between the bars, than when simply plain bars are used, whether the same are so called adjustable or otherwise. The pins, by softening the cotton passing over them, relieve the edges of the bars from the effect of a harder condition of the cotton and materially add to their durability, as when the bars become worn on their edges which are presented to the action of the cotton passing over them, they fail, without these pins, to strip the fibers of the seeds and leaf. The pins are so made that no cotton can cling to them, consequently there is no danger of injuring the staple.



This company has recently completed the installation of 173 sets of its bars in the nineteen different mills owned by B. B. and R. Knight, of Providence, R. I., orders for which were given only after a thorough test in each mill.

The following cotton mills besides the Knights, have these pin grid bars in operation: Manville Company, Manville, R. I.; Clark William Company, Westerly, R. I.; Cutler Mfg. Company, Warren, R. I.; Crompton Company, Crompton, R. I.; Lawton Spinning Company, Woonsocket, R. I.; Greene & Daniels Mfg. Company, Pawtucket R. I.; Shetucket Company, Norwich, Conn.; Atlantic Mills, Lawrence, Mass.; Bristol Mfg. Company, Fall River, Mass.; Border City Mfg. Co., Fall River, Mass.; Chase Mills, Fall River, Mass.; Davol Mill, Fall River, Mass.

ELECTRIC-HYDRO EXTRACTOR.

The accompanying illustrations refer to an electric hydro-extractor made by Dienett & Eisehardt, Inc., Philadelphia, who have added its product to their well known line of steam and belted machinery.

This is another example of attaching electric power direct to the machine to be operated. The advantage and economy of individual electric motors for operating machines has been demonstrated in connection with other apparatus used in the factory. In this instance many of the objectionable features accompanying the use of leather cones, belting, etc., are done away with and a practical and satisfactory machine is presented to the trade.

Figure 1 is a cross sectional view of a direct current type of extractor. It will be noted that the lower section comprising the basket and tub is of the usual standard construction, including the hardened pin and revolving disc type of step bearing. The main shaft extends through

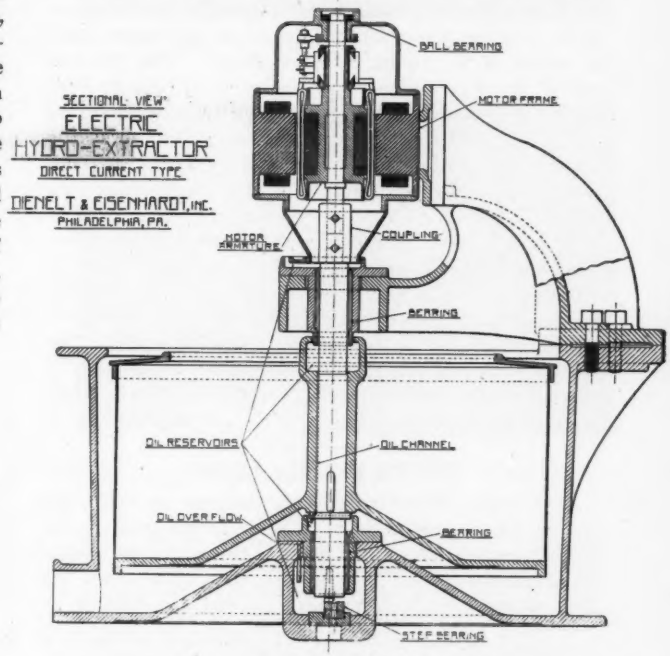


FIG. 1.

FIG. 2.

the basket and a top bearing of ample size, above which it is coupled to the shaft of the motor armature which is directly in line with it. The stationary portion of the motor is supported by a substantial extension of the tub casting, and this extension arm also supports the top basket bearing and the motor starting devices. As this arm extends from one side of the tub only, the basket can be loaded and unloaded from almost any point on its rim.

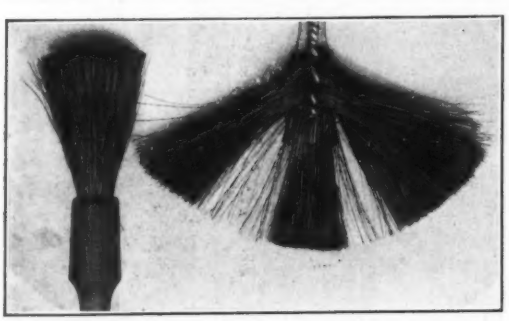
The top motor bearing is a self-lubricating type of ball bearing and throughout the entire machine it is not possible for any oil or grease used for lubrication to work its way into either the motor windings or the basket. All the oil fed to the bearing above the basket passes through the bearing to a reservoir below it from which it feeds the lower bearing through a slot in the shaft, after which it accumulates in the reservoir surrounding the stop bearing and all overflow is led into the bottom of the tub and is carried off with the drips.

In the alternating current types the motors are provided with two ball bearings, one above the rotor and one below, and the motor shaft is joined to the basket shaft by means of a coupling of novel design. This prevents any of the side motion of the basket shaft, due to wear of the top basket bearing, from being transferred to the motor shaft which in this type of motor must always be exactly central with the stationary part of the motor. Both direct and alternating current extractors are provided with a friction brake for stropping the basket.

Figure 2 is a general view of the complete machine. The absence will be noted of all the usual power transmission devices such as leather cones, belting, gearing and disc wheels, also of side or top steam engines with their usual steam fittings and cumbersome supporting arms. The electric extractors are made in three sizes, 30, 36 and 42 inches and the baskets can be made in any style which may be desired.

FINGER SPINDLE BRUSH.

The brush shown herewith is designed to avoid the falling out of bristles when in use. In the making, the bristles are laid across and between two wires, the middle of the bristle resting between the wires. The wires are then twisted evenly by machinery, and the bristles so



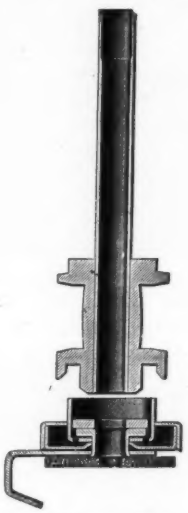
SHOWING WHY THIS SPINDLE CAN NOT SHED BRISTLES.

secured firmly in place. One end of the wire is drawn through the handle and extends from the top enough to permit of its being bent over to form a hook; the ends of the twisted wire resting on the end of the handle, preventing the brush and wire from slipping. When the wire is in place the bristles are bent downward and held securely in the bowl of the handle. The peculiar manner of making absolutely prevents flying bristles. It can be used as a spindle brush, or for hosiery and knit goods machines. M. M. Lahue & Co., of Lowell, Mass., are the manufacturers, and will send samples and quotations on request.

SPINNING TUBE.

We show herewith an illustration of a spinning tube made by the Bamford & Smith Company, Providence, R. I. This tube has met with flattering favor wherever it has been put into use by spinners, and the testimonials concerning it, to which our attention has been directed, warrants us in speaking in high terms of its practical success.

In response to many inquiries, investigations have been



SPINNING TUBE.

instituted among manufacturers who have used this tube, in reference to its efficiency, with the result that it has been spoken of in the highest praise. These investigations have been made independently and without the knowledge of the makers of the tube, and many of those who responded to the inquiries are unknown to them, because of the confidential nature of the investigations, which goes to prove that this tube is worthy of adoption and use wherever its utility can be made of value.

A ROTOR VENTILATION.

The Barney Ventilating Fan Co., Boston, Mass., manufacturers of the Barney "compound ventilating fans," is making an unusual announcement to textile mill men for the month of January. In addition to ventilating fans of different types, it makes a "rotor" ventilator for which it

ROTOR VENTILATOR.

claims several advantages. It is made of best quality charcoal iron, that has been pickled to remove all scales and then coated with pure tin. After the ventilator is made it is galvanized. Inquiries regarding the "rotor" received by the manufacturer during January, 1909, that lead to purchase will entitle the purchaser to a liberal discount. The company's announcement appears elsewhere in this issue.

TELEPHONE CABLE AND ITS MANUFACTURE.

In the supply department of many telephone companies, snow shoes are kept in stock. They are for the men who are known as trouble shooters—men whose duty is to maintain telephone line construction in good order and whose experiences during the winter months on open wire lines are often more wonderful than many adventures recounted by writers of fiction.

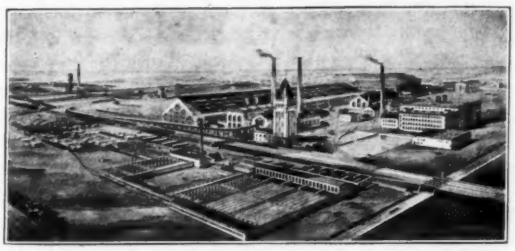


FIG. 1. THE HAWTHORNE WORKS OF THE WESTERN ELECTRIC COMPANY IN WHICH TELEPHONE CABLE IS MANUFACTURED.

The increasing use, within recent years, of telephone cable in place of open wire lines, has robbed the trouble shooters of many interesting experiences. Telephone companies have found that interruptions to service can be reduced, the heavy maintenance expense of open wire lines overcome and the appearance of the streets improved by using telephone cable in place of open wire lines.

The manufacture of telephone cable is carried on a gigantic scale in the Hawthorne Works of the Western Electric Company at Chicago. This plant, shown in Fig. 1, covers one hundred and fifty acres of ground and utilizes 847,000 square feet of area. Its capacity for turning out telephone cable is twenty million conductor feet per day or over 22,727 miles per week.

Interior views of this cable plant—the largest in the world—are shown in Figs. 2, 3 and 4. Fig. 2 shows the insulating and twisting machines, each individually operated by Western Electric motors. All overhead shafting, pulleys, belts, etc., are eliminated, permitting the machines to operate at maximum efficiency and resulting in low maintenance cost.

FIG. 2. INSULATING AND TWISTING MACHINES.

Fig. 3 shows the stranding machines, and the cable core in process of being formed. In the foreground the cable core is being wound automatically upon an iron truck just previous to being dried in an oven.

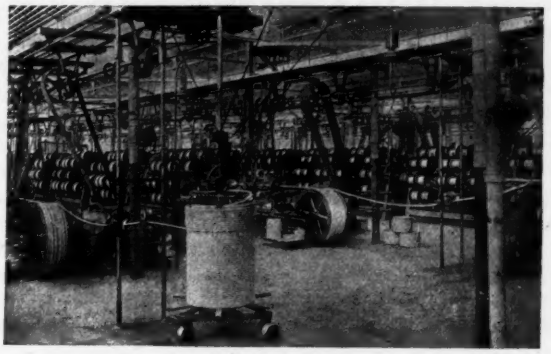


FIG. 3. STRANDING MACHINES.

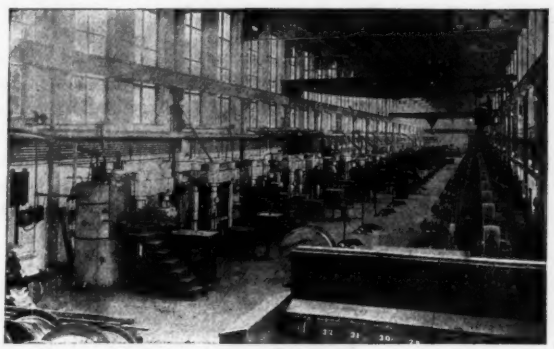


FIG. 4. LEAD PRESSES AND HYDRAULIC PUMPS FOR INCASING CABLE IN ITS SHEATH.

Fig. 4 shows the lead presses and hydraulic pumps by means of which the cable is encased in its sheath. The large light room equipped with overhead cranes for handling the finished product aids the men in securing the best results.

Every operation in the manufacture of the cable, from beginning to end, being carried on in this plant, has the advantage of securing uniformity of construction and adaptability to the purpose for which it is intended.

THE YALE & TOWNE MANUFACTURING CO., New York. We are in receipt of an illustrative catalogue of this company's manufacture of chain blocks for electric hoists, trolleys and cranes. Hoisting devices are as old as civilization, but it was not until Thomas A. Weston, in 1854, invented the differential pulley block that the world had a portable hoist which was at once powerful, safe, convenient and cheap. Utilizing the principles of the Chinese windlass, but substituting an endless chain for its rope, and iron sheaves for its wooden drum, Mr. Weston produced the first "chain block" as a new "mechanical power," which enabled heavy loads to be lifted with little effort (although at slow speed), and which possessed the unique feature of always holding the load self-sustained. As an outcome of Mr. Weston's invention there was developed,

some twenty years later, the screw-geared type of chain block, which possesses advantages for certain uses. A further and probably the final step was taken, also by Mr. Weston, when, about 1889, he invented the triplex block, whereby the lifting power of a man, in using a chain block, was increased nearly threefold, and his efficiency still more. The Yale & Towne Mfg. Co. have always been the sole licensees under Mr. Weston's American patents.

UNIVERSAL ROUTING MACHINE.

The accompanying illustration shows a machine especially adapted for cutting the grooves in stair strings, and other work of a similar character. It is attached to or swung from a post or the wall, and is driven by a vertical shaft.

The framing is quite heavy to prevent vibration, and the joints are mounted on trunnions so as not to interfere with the speeded shafts. The movement is universal in horizontal directions; as a result, grooves may be cut in any direction on a plane.

The spindle containing the cutting has a vertical movement for depth of cut, and is provided with a collar that comes in contact with forms or guides for directing the course of the grooves.

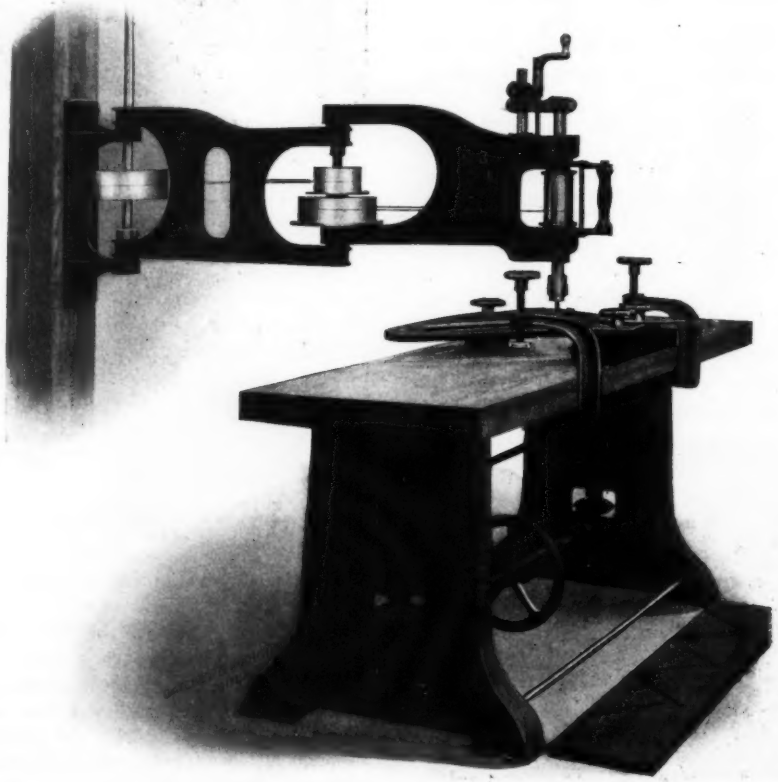
The framing and slides are made of cast iron, whilst the top is made of glued-up wood. The table has a vertical adjustment of several inches, to provide for different thicknesses of materials. The adjustment is accomplished by a handwheel beneath which, through bevel gears, operate substantial screws at each end. For making stair strings, the table is provided with a detachable form, beneath which the stair strings to be grooved pass. This form or guide directs the spindle by coming in contact with collar on spindle, and by this means the grooves in stair strings are made to receive the tread and rise, including room for wedging. The form is reversible so as to make strings for both sides of stairs. Therefore the machine as shown is very complete for making rapidly, and in the most perfect manner, stair strings of the latest and most improved form or style.

The machine will require two belts to operate it, one 8 feet long and 3 inches wide, the other 6 feet 6 inches long, and 3 inches wide. All machines are fully tested before leaving the works, and warranted to be as represented. They may be returned free of expense to the makers, H. B. Smith Machine Company, Smithville, N. J., within thirty days after date of shipment, if not satisfactory, and the money shall be refunded.

THE WESTERN ELECTRIC CO., New York City, is sending to the trade a bulletin covering its three-wire generator. As this generator contains several points of especial merit, namely, that it has only one slip ring and no auxiliary apparatus whatever is necessary for its operation, it is believed that this bulletin will be found of especial interest.

THE BABCOCK & WILCOX COMPANY has purchased from the Rust Boiler Company its patents and plant located at Midland, Pa., and will continue the manufacture, at that point, of the Rust water tube boiler.

HARDING-FANCOURT & SCULL, INC., 1095 Germantown



UNIVERSAL ROUTING MACHINE FOR STAIR STRINGERS.

Ave., Philadelphia, Pa., manufacturers of the well known "tuscan softener," for fast black dyeing advise us that they have recently purchased the old Kensington Soap Works, established in 1851, and are now in a position to quote attractive prices on all grades of mill soap. The soaps manufactured by the Kensington Soap Works bear an excellent reputation and manufacturers desiring a good tallow, palm or olive soap, in fact anything in the soap line, will do well to communicate with this concern.

THE WESTERN ELECTRIC COMPANY, New York City, has recently issued a very attractive booklet relating to the new "magneto" telephone wall sets it has lately placed on the market. These telephone sets differ from others in having the line binding post inside the set and in the redesign of the bell, generator and switch hook. These improvements have given the sets a most attractive appearance, and have increased their efficiency, reliability, simplicity and accessibility.

THE WHEELER-EDWARDS AIR PUMP is the subject of an elaborate treatise published by the Wheeler-Condenser & Engineering Co., Carteret, N. J. The peculiar action of this pump in handling both air and water is explained and it is shown how the absence of foot and bucket valves, and an exceedingly small clearance results in the attainment of a high vacuum, otherwise to be had only by means of separate dry vacuum pumps, hot well pumps, and air coolers.

TETRAPOL is an effective medium for the washing or scouring in dilute aqueous solution of all classes of textile materials. It is a yellowish liquid perfectly stable either in a concentrated or diluted state. It is non-inflammable and therefore differs entirely from ether, carbon bisulphide and similar products. It contains no free alkali or other substance which can affect textile fibers detrimentally. It is guaranteed free from chlorine, silicate of soda and soda. It is capable of dissolving and retaining in solution, dirt, fats and oils of all kinds, including mineral oils or pretroleum, and as a washing agent is unequalled although it does not lather like soap. Unlike ordinary soaps, it is not decomposed by calcareous water, since it does not form a lime soap. Tetrapol does not impart a smell to the materials washed. The goods also remain perfectly free from an odor when stocked and therefore it offers an advantage in this respect over other scouring agents. It is further not decomposed by acids as ordinary soaps are. Taking into account its efficiency it is cheaper in use than other scouring agents, such as, soft soap, hard soap, etc. Being liquid it is always ready for immediate use, requiring no preparation. It is simply stirred up with cold water and is then ready for use. It should not be mixed with hot water or boiled with same. It can be combined with soap or soda in any proportion if desired. Sold by the Farbenfabriken of Elberfeld Co., New York.

THE CUBAN DEMAND FOR NON-FLUID OILS has grown to such an extent that the manufacturers, the New York & New Jersey Lubricant Co., 14 Church St., New York City, have decided to place a stock of their various grades with agents in every town of any size on the island. W. F. Kimball, vice-president of the company, has just gone to Cuba to facilitate the arrangements. Non-fluid oils first attracted attention through their ability to lubricate fully as well as the finest fluid mineral oils, but without dripping to waste, like ordinary oils, and without retarding the bearings as do greases. The dripless consistency is obtained by condensing pure lubricating elements, instead of thickening with fats, waxes, tale, rosin, or graphite as in greases.

WESTERN ELECTRIC COMPANY, New York. This company completed its contract for the replacement of the destroyed Paris (France) telephone switchboard well within time. The Chicago plant of this company started work on the big switchboard October 3, shipped it to New York on October 23 and it arrived in Paris on the steamship "La Provence" November 6. This is the second record made within a year by this company for rapid telephone exchange replacement; the other being that of the Antwerp exchange—the oldest in Europe—for which a 5,000-line equipment was manufactured and installed in 30 days. The Paris contract covered a 10,000-line equipment and while apparently involving but twice the labor of the other, in reality meant several times more. The fast time made stands as another triumph for American skill and enterprise.

LARGE VALVE ORDER FROM GOVERNMENT. Last June the Isthmian Canal Commission invited bids for a large quantity of bronze globe and angle valves fitted with seats and discs that were capable of being renewed. Considerable competition resulted and after the authorities at both the Isthmus and Washington had carefully considered the bids submitted by a number of manufacturers, they decided to place the order, comprising upwards of seven thousand valves, in sizes ranging from ¼ to 3 inches inclusive, for the Lunkenheimer "Renewo" renewable seat and disc regrinding valve. This is considered quite a tribute to the efficiency of design of this article, especially in view of the fact that it has not been upon the market quite as long as some other well-known makes. This valve is practically indestructible, inasmuch as every part that is subjected to any possible wear can be easily, quickly and cheaply renewed—a most desirable feature. These valves are guaranteed for 200 pounds working pressure, and are manufactured by The Lunkenheimer Company of Cincinnati, Ohio.

QUEEN & CRESCENT ROUTE has upon its line many openings for the establishment of industries at desirable locations where inducements can be offered either in the taking of stock, donating land, or sites. For example, there are places on this route desiring to secure cotton mills, cotton seed oil mills, woolen mills, hosiery mills, etc. In all of these places the raw material is cheap and abundant as well as convenient. Fuel is plentiful and cheap, and labor is also plentiful and can be obtained at low wages. Facilities for shipping the manufactured product to the center of consumption are exceptionally favorable. By addressing William M. Bamberge, Land & Industrial Agent, Queen & Crescent Route, Lexington, Ky., inquirers can be placed in correspondence with the principals, or those directly concerned.

INDUSTRIAL PLANTS. This is the title of a handsomely executed book with illustrations and descriptions of manufacturing and other establishments of which Fred S. Hinds,

of Boston, Mass., was the architect and engineer. The book refers specifically to reinforced concrete manufacturing plants, including factory machine shops, electric power plants, warehouses, chimneys, etc.

NYE & TREDICK CO., Philadelphia, Pa. The present business quarters of this company are 718-720 Cherry St., Philadelphia.

THE DRAPER COMPANY, Hopedale, Mass. We are in receipts of a calendar for 1909 that this company is sending to its customers. It bears a colored illustration of its broad sheeting L model loom, a description of which appeared in our November issue.

PHILLIPS PRESSED STEEL PULLEY WORKS, Philadelphia, Pa. We are in receipt of an illustrative folder relating to pressed steel pulleys manufactured by this works which manufactures split pulleys, four and six-arm pulleys of pressed steel, etc.

WESTERN ELECTRIC COMPANY, New York. We are in receipt of two booklets issued by this company prepared on the care and operation of direct current motors and generators. The text matter is highly instructive to any one interested in the subject treated, notwithstanding its special application to the manufactures of this company. We are also in receipt from this company of its bulletin on steam turbines showing their efficiency and economy in replacing other means of power for a great many classes of service.

THE WESTINGHOUSE DIARY FOR 1909. The Westinghouse Electric & Manufacturing Co., Pittsburg, Pa., has published for 1909 a diary with maps and other matters on subjects of the following character which are of interest to engineers and users of power apparatus: High pressure steam turbine, Leblanc condenser, low pressure steam turbine, mechanical stoker, mercury vapor lamps, motor testing, storage battery, single phase railway systems, tungsten lamps, turbo pumps and blowers, and Westinghouse-Nernst lamps. We have also received from this company its booklet No. 2, of a series of textile motor talks, referring specifically to cotton mill belts in the spinning room and elsewhere in the factory.

FARBENFABRIKEN OF ELBERFELD CO., New York, has issued color cards as follows: *Brome Indigo F B paste, and Brome Indigo F B powder.* This product is used for dyeing wool and silk, and yields shades which are overhand and down-hand redder and considerably clearer than those produced with indigo. For fastness to washing and boiling, light, etc., it is quite as good as indigo. *Diazo Fast Black V* is very serviceable for the dyeing of all kinds of cotton material such as loose cotton, cotton yarn and piece goods, hosiery, etc., when a good fastness to washing is required. *Mono Chrome Brown G paste* which dyes level and is employed for producing full dark browns, as well as mode browns, etc. It is recommended for the dyeing of all classes of wool, as loose wool, slubbing, yarns and piece goods. *Rosole Red B extra* and *Rosole Scarlet G extra* are excellently adapted for the production of clear bluish or yellowish pink on lose cotton, yarn and piece goods. *Diazo Fast Black extra* gives a pleasing shade of good fastness to washing and light. It is recommended for the dyeing of loose cotton, hosiery, piece goods, etc.

STEPHENSON MANUFACTURING CO., Albany, N. Y. The January calendar issued by this company has been received by us, on which is the picture of an attractive maiden.

CELL DRIER MACHINE CO., Taunton, Mass. Bulletin 812, published by this company, relating to its cell drier, has been received, containing many illustrations showing the functions of this machine and containing practical suggestions for their application to various needs in the finishing of textile goods, and several sketches of installation to show actual saving in the handling of fabrics and economy of floor space effected.

SYRACUSE CHILLED PLOW CO., Syracuse, N. Y. We are in receipt of an illustrative catalogue issued by this company relating to its wheelbarrows, trucks, etc., that are in common use about the factory.

THE AMERICAN BOILER ECONOMY CO., Philadelphia, Pa. We are in receipt of an illustrative catalogue issued by this company relating to its Copes boiler feed regulator for maintaining a constant water level in steam boilers, and the Copes pump governor for maintaining the pressure in the boiler feed line at a fixed excess over boiler pressure and for regulating the discharge of house pumps, fire pumps, elevator pumps, small water works, pumps, etc.

LEGAL STATUS OF A TRADE MARK.

The suit of the Holeproof Hosiery Co. against the Wallach Brothers, proprietors of a chain of retail stores in New York City, and distributors for the "Knotair" Hosiery Co., West Philadelphia, for a preliminary injunction restraining the latter from selling "Knotair" hosiery or "guaranteed hose," "guaranteed hosiery" or "the hose sold with a guarantee," has been decided in favor of the defendants, by the United States Circuit Court for the Southern District of New York.

The court, however, enjoins Wallach Brothers from using the same style of box and printed matter as are used by the Holeproof Hosiery Co.

The opinion of the court, in part, is as follows:

Complainant wishes to prevent defendant from—

First—Using in connection with hosiery the word "Holeproof" or any like word.

Second—From using in like connections the words "guarantee," "guaranteed hose" or "guaranteed hosiery" or words similar thereto.

Third—From employing in like connection boxes, labels, guarantee tickets, bands or devices identical with or deceptively similar to those referred to in the bill and produced on this hearing, and

Fourth—From selling, or offering for sale as guaranteed hosiery or "holeproof" hosiery or otherwise as a product of the complainants, any product not the complainant's.

First—The first branch of the prayer for relief raises the question whether "knotair" is a like word to "holeproof" or so similar thereto as to be likely to deceive the average purchaser of the product to which it is applied—*i. e.*, hosiery for men and women of no very high grade. By this I mean hosiery which may reasonably expect purchasers from among persons in moderate circumstances.

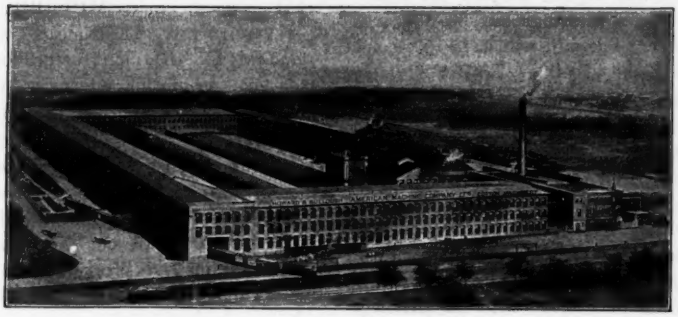
This is to be regarded as a question of trade-mark, and

C. E. RILEY, Treas.
Boston Office
65 Franklin St.

HOWARD & BULLOUGH
American Machine Company, Ltd.
PAWTUCKET, R. I.

Southern Offices
814-816 Empire Bldg.,
Atlanta, Ga.

COTTON MACHINERY



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SEND FOR OUR DESCRIPTIVE CIRCULARS WITH LISTS OF USERS.

HOPPER BALE OPENERS
FEEDERS
SELF FEEDING OPENERS
BREAKER INTERMEDIATE
and FINISHER LAPPERS

REVOLVING FLAT CARDS
DRAWING FRAMES
SLUBBING FRAMES
INTERMEDIATE and
ROVING FRAMES

IMPROVED SPINNING FRAMES
TWISTERS
CONE WINDERS
WARPERS and SLASHERS

WE INVITE YOUR INVESTIGATION AND COMPARISON.

the point should not be obscured by simultaneously considering suggestions of unfair competition.

Laying aside the question (not raised at bar) whether "holeproof" is not a descriptive word and one descriptive of qualities which no pair of wearable stockings can ever really possess—and whether the word "knotair" is not open to the same criticism—the question is this: . .

If there was absolutely no similarity in the dressing, advertising, wrapping and method of selling these two brands of hosiery except the use of the trade-mark "holeproof" by one proprietor and of the trade-mark "knotair" by the other, could infringement be declared? To me it is quite plain that there would be no infringement, and the matter is assuredly not so clear as to warrant the issuance of a preliminary injunction under this branch of the relief prayed.

Second—As interpreted in argument, the second item of relief prayed for means that defendant should be restrained from selling "knotair" hose or guaranteed hose as guaranteed hosiery.

Since it is admitted that as a business method the guaranteeing of hosiery or any other article of merchandise is open to the world, this line of argument suggests the query—Whether any development of the business of selling hosiery with a guarantee can so effectually appropriate to one manufacturer or merchant the right to call his product "guaranteed hosiery" as to prevent other persons from doing the same—provided they do nothing else objectionable?

But this inquiry need not be pursued, because in my opinion the complainant has not shown that it has so completely appropriated and made its own the business of selling guaranteed hose as to render the use of that phrase (without more) suggestive to the general public of their "holeproof" product.

Third and Fourth—In my opinion, the evidence is overwhelming that in the packing, labeling, dressing, use of color and arrangement of type, defendant has used and is using unfairly competitive methods.

The weight of evidence is also in favor of complainant in asserting that defendant through its salesmen has palmed off its goods upon customers as the goods of complainant.

The injunction as prayed for will issue except that defendant will not be enjoined from using the word "knotair" as applied to hosiery, provided such use be not accompanied as induced by the deceptive competitive methods above indicated and excepting also the defendant will not be enjoined from advertising, naming or describing "knotair" hosiery as guaranteed hose or hose sold with a guarantee, provided that such expression of warranty be not contained, printed, set forth, as advertised in words, letters or figures calculated to induce belief that defendant's guaranteed "knotair" hosiery is complainant's guaranteed "holeproof" hosiery.

Up to the present time there has been no black found yet which is superior in shade to those got by logwood.

In the manufacture of cotton goods Germany holds third place, being only exceeded by the United Kingdom and the United States.

If wool could be dyed below boiling point it would be a great advantage to wool dyers, but, unfortunately, with the exception of vat indigo, this is impossible.

MILL NEWS.

Notices of mill projects, additions or improvements are solicited for this department.

ALABAMA.

COLUMBIA. A. D. Wood, to whom we referred in our last month's issue as building a cotton yarn mill in this place with 5,000 spindles, will expend $30,000 for buildings, the main one to be two stories high 80x230 feet with basement for electric power. The mill will have 150 looms for manufacturing shirting and sheeting.

LINEVILLE. A company is being organized in this place to build a cotton mill. M. B. Lewis of Birmingham can furnish information.

GEORGIA.

AUGUSTA. The Gavin Manufacturing Co., to which we referred in our last month's issue as being incorporated for the manufacture of hosiery, has been organized with J. Inman Davis, president, and J. J. Tyler, vice-president. This company has a capital of $10,000 with the privilege of increasing to $50,000.

COLUMBUS. The Eagle & Phenix Mills are to erect an additional story to their finishing department, 40x100 feet of standard mill construction, at a cost of about $5,000.

COLUMBUS. The Topsy Hosiery Mills are to build a 50-foot addition which will increase the capacity of the plant one-third. The present equipment has 170 knitting machines, etc. Their product is dyed and finished at the mill.

GRIFFIN. The Cherokee Mills have about completed their main building 125x350 feet, two stories high, and will install a steam plant of 600 horse-power. The product of the mill will be cotton blankets and towels.

ROME. The Rome Hosiery Mills will erect a mill building, dye house and boiler room to which the plant will be removed. An automatic-sprinkler system will be introduced. The mills are now operating one hundred machines, dyeing and finishing equipment, etc., for the manufacture of seamless hosiery.

SUMMERVILLE. In our last month's issue we referred to a plan for the erection of a mill in this place for manufacturing cotton yarn with a capital of $250,000, and 10,000 spindles, in which we stated that C. F. McKinney, Boston, Mass., was one of the interested parties. We should have given the address of Mr. McKinney as Greenville, S. C., instead of Boston. The product will be 30s to 40s yarn to weave 38½-inch print cloth.

THOMASTON. The Thomaston Cotton Mill is to erect an addition to its present plant and install 8,000 spindles, etc. O. A. Robbins, Charlotte, N. C. is the engineer in charge.

KENTUCKY.

LOUISVILLE. Bradford Worsted Spinning Co. has been incorporated with $20,000 capital and has organized with Frank S. Tuley, president. This company has leased the Eclipse Woolen Mills and will install new machinery with preparatory and finishing machines. We referred to this enterprise in our last month's issue.

MINNESOTA.

ST. CLOUD. The St. Cloud Knitting Works with a capital of $15,000 is to be incorporated and will occupy a new building. Their product is woolen hose.

MARYLAND.

BALTIMORE. The Consolidated Cotton Duck Co. is to re-equip its mill at Phoenix, but the number of spindles and looms has not yet been decided upon, but probably about 6,000 spindles and 100 looms will be installed.

HAGERSTOWN. In last month's issue we noted plans for the erection of a silk mill here to be constructed by C. W. Lloyd. Cromer Bros. are the owners and they will erect a two-story building 36x120 feet to cost $5,000. Their product will be silk ribbons.

MISSOURI.

KANSAS CITY. The Kansas City Knitting Co. has been organized for the manufacture of knit underwear. We made mention of this enterprise in our last month's issue.

NORTH CAROLINA.

ASHEBORO. A textile mill is proposed for this place. O. R. Cox of Thomasville is interested.

CAMERON. Thos. Jones, Kernesville, N. C., is interested in a proposed knitting mill at this place.

BURLINGTON. In our November issue we referred to the Burlington Dye Works of this place, and now we have to state that there has been installed machinery, capable of a daily output of 150 dozen pairs of hose dyed and finished.

CHARLOTTE. In our last month's issue we referred to the Jewel Cotton Mill as proposing to erect a plant of 6,000 spindles for manufacturing fine combed yarns. The plans are now ready and the company would like to receive bids for the erection of its buildings. Stuart W. Cramer of this place is the architect.

GREENSBORO. The Revolution Cotton Mills are to build a bleachery two stories high, 105x135 feet for one structure, and for another one 55x65 feet at a cost of $40,000 for the two.

LAURINBURG. J. P. McRae of this place is organizing another company to build a 15,000 spindle yarn mill.

LEXINGTON. C. A. Hunt, Jr., is to organize a company with a capital of $125,000 to erect a factory for the manufacture of colored cloth. The capacity of the factory will be 10,994 spindles, but only 8,208 and 350 looms will be installed at first. The motive power, probably, will be electricity. About 350 horse-power will be required. We understand that machinery is wanted.

SANFORD. We understand that a bleachery is to be started here in which Robt. L. Steele of Rockingham is interested.

SCOTLAND NECK. The capital stock of the Scotland Neck Cotton Mills is to be increased from $148,210 to $250,000. The additional capital will be used for erecting another building and installing more machinery to double the present capacity.

STONY POINT. A cotton mill is proposed for this place in which J. W. Watts of Liledoun, is interested. The capacity of the mill is to be 4,000 spindles, and the motive power will be electricity generated from water power and transmitted two miles distant. We are informed that machinery is wanted.

TAYLORSVILLE. A cotton mill is about to be organized in this place with a capital of $100,000. O. L. Hollar of this place can furnish information.

WAYNESVILLE. A company is being formed here to build a cotton mill in which W. W. Glenn, of Gastonia, is interested.

ZEBULON. Archibald Meldrum and associates will incorporate this month their proposed cotton mill company.